DOCUMENT RESUME

ED 193 472 CE 026 790

TITLE	Identification of Mathematics Competencies for Vocational, Technical and Adult Education through a Survey of Employer/Incumbent Employee Expectations. Final Report.
INSTITUTION	Northeast Wisconsin Technical Inst., Green Bay.
SPONS AGENCY	Wisconsin State Board of Vocational, Technical, and Adult Education, Madison.
PUB DATE	Aug 80
NOTE	184p.: Some pages will not reproduce well due to light type.
EDRS PRICE	MF01/PC08 Plus Postage.
DESCRIPTORS	*Adult Vocational Education: Community Colleges: *Competence: Competency Based Education: Employee Attitudes: Employer Attitudes: Employment Qualifications: Graduate Surveys: Job Analysis: Job Performance: *Job Skills: *Mathematics: Mathematics Curriculum: Mathematics Education: *Occupational Information: Postsecondary Education: *Technical Education

ABSTRACT

Employer and employee expectations and satisfaction with the mathematics competencies essential to perform in fifteen occupations were identified through mailing 1839 surveys (25% return) to employees who were 1977, 1978, and 1979 graduates of fifteen occupational programs in at least two Vocational Technical Adult Education (VTAE) districts in Wisconsin, and their employers. From these survey results an improved model or set of mathematics competencies which can be used to develop a VTAE mathematics curriculum for any occupation was created. The pilot study also led to development of a profile matrix of mathematics competencies which discriminates those competencies common to all occupations and those peculiar to fifteen specific occupations. The report contains a master list of 600 mathematics competencies: a summary network for the project: an activities-time line: a summary of organization, objectives, and major decision points: the survey instrument: responses to open ended questions: and a profile matrix of mathematics competencies by occupations. (KC)

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FINAL REPORT

PROJECT NO. 13-055-138-180

IDENTIFICATION OF MATHEMATICS COMPETENCIES FOR VOCATIONAL, TECHNICAL AND ADULT EDUCATION THROUGH A SURVEY OF EMPLOYER/INCUMBENT EMPLOYEE EXPECTATIONS

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The research reported herein was performed pursuant to a contract with the Wisconsin Board of Vocational, Technical and Adult Education, partially funded by the Governor's Employment and Training Office, using funds from the Comprehensive Employment and Training Act. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgement in the conduct of the project. Points of view and opinions expressed herein do not, therefore, necessarily represent official NWTI, WBVTAE or GETO positions or policies.

AUGUST 1980

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SUMMARY

In this study the employer and employee expectations and satisfaction with the mathematics competencies essential to perform in fifteen occupations were identified through a survey. An improved model and set of mathematics competencies which can be used to develop Vocational, Technical and Adult Education mathematics curricula for any occupation was developed. A profile matrix of mathematics competencies v.s. occupations was developed which discriminates those competencies which are common to all occupations and those which are peculiar to specific occupations. The methods used to achieve the objectives are recommended. This was a pilot study and tentative findings have been established. The interim results need to be tested and verified in an expanded study.

ACKNOWLEDGEMENTS

This project could not have been completed without the cooperation, assistance, and encouragement of many people. Donald Bressler, NWTI Campus Administrator, and Darrell Smith, NWTI Research Specialist, helped in developing the study. Bob Bilot, NWTI Mathematics Instructor, and Dannis Schouten, NWTI Mathematics Instructor, deserve special recognition for the time and effort they expended to help develop a master list of mathematics competencies and survey instruments for the occupational programs studied. The participants in the WBVTAE Mathematics Instructors Spring Workshop provided many valuable suggestions. The members of the Ad Hoc Basic Skills Advisory Committee assisted in reviewing the project and provided encouragement. In addition, without the cooperation, assistance, and encouragement of the occupational instructors and their advisory committees this project could not have been accomplished. Barry Mirkin, Director of the WBVTAE component of the CETA-GETO Interagency Basic Skills Project, gave guidance and leadership to the project. Special thanks go to Norma Nelson for the secretarial support of the project.

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CHAPTER I BACKGROUND

PURPOSE

The overall purpose of this project was to compile a set of Mathematics Competencies which can be used to develop Vocational, Technical and Adult Education curricula for any occupation/cluster. Another purpose was to determine those competencies which are common to all occupations/clusters and those which are peculiar to specific occupations/clusters.

SCOPE

The scope of this project was limited to the determination of Mathematics Competencies for at least 15 occupations. The occupations were selected from the vocational and technical programs offered in the VTAE Districts throughout the State of Wisconsin. The employers and incumbent employees (graduates of technical institutes) in these occupations were surveyed to determine their opinions concerning Mathematics Competencies required to function on the job. The incumbent employees were graduates now working in their occupational field.

ASSUMPTIONS

The technical institute will continue to prepare people for the world of work and provide trained human resources for industry. Business, industry, and governmental institutions will continue to need trained workers. The population served by a technical institute will continue to grow. The advantage of replacing labor with equipment will diminish. The human resource will require more education and training in preparation for a job.

Greater pressures will be exerted by governmental agencies and community groups to increase employment and promotion opportunities for minorities, females, veterans, handicapped, and individuals in older age groups. The implications from Equal Employment Opportunity or Affirmative Action Programs are that these minorities will have to attain the behaviors and exhibit the mathematical skills necessary to perform the jobs that they apply for.

The unemployment rate for the United States labor force will increase. The influx of refugees to the United States will not diminish. Population growth coupled with the unemployment rate will require that training and retraining programs expand to meet and serve the needs of society.

The rapid growth and change in both technology and knowledge requires that continuing education programs be designed to train and retrain the human resource to keep in step and cope with these changes.

Our technological society will continue to become more complex and quantitative. In order for an adult to participate effectively and efficiently in our society it is essential that mathematical skills be mastered.

The growth of new occupations for which people require training will continue. On the other hand, some occupations will become obsolete. Technical institutes will continue to develop new programs to train people in these new occupations.

There exists a list of basic mathematics skills that are essential for a person to exhibit in order to perform and function successfully in a new or current occupation.

NEED

Business, industry, governmental institutions, and society at large are expressing widespread concern for the need to upgrade basic mathematics proficiency levels. Technical institutes stand firmly behind the need to improve and refine efforts to provide instruction in basic mathematics skills.

The changing needs of society and the world of work requires a redefining of the priorities for mathematical skills. Our technological society demands the use of mathematical skills such as arithmetic, geometry, algebra, trigonometry, statistics, and computer. The application of mathematics in the world of work includes such mathematics skills as estimating, problem solving, measuring, analyzing large amounts of quantitative data, and the use of computers.

A list of mathematical skills must include, but not be limited to, arithmetic computation. If an individual's mathematical capabilities are primarily limited to drill and practice in arithmetic computations then limited job opportunities are open. In fact unemployment is likely when basic mathematical skills are restricted to arithmetic computation.

PROBLEM

The problem was to identify employer and employee (VTAE graduates) expectations and satisfaction with the mathematics competencies essential to perform in fifteen occupations.

OBJECTIVES

The objectives of this study were:

(1) To review and analyze existing mathematics skills competency lists.

(2) To synthesize a composite (master) list of mathematics competencies.

(3) To articulate and synchronize the mathematics competency list with occupational instructors and their advisory committees.

(4) To develop a list of mathematics competencies essential for an occupation/cluster.

(5) To articulate project at WBVTAE mathematics meetings, DPI workshops, and Basic Skills Advisory Committee meetings.

(6) To develop a unique survey instrument for each occupation/cluster.

(7) To pilot the survey instrument for each of the fifteen occupations in two VTAE Districts.

(8) To conduct a computer analysis of the survey.

(9) To determine those mathematics competencies which are common to the 15 occupations and those that are unique to a specific occupation.

(10) To prepare a final report on the results of the project.

OUTCOMES

(1) An improved model or set of mathematics competencies which can be used to develop VTAE mathematics curriculum for any occupation/cluster;

(2) A profile of mathematics competencies which discriminates those competencies which are common to all occupations/clusters and those which are peculiar to specific occupations/clusters.

REQUIREMENTS

(1) A ratio of about two to one, vocational diploma to associate degree programs were addressed in the study;

(2) A representative distribution of programs were addressed from the following areas - Trades & Industry, Business and Marketing, and Office Education;

(3) CETA-eligible graduates were involved in the employee/employer samples where possible;

(4) Graduate employees, and employers from at least two VTAE districts were included in the samples;

(5) The sample surveys were composed of six to eight employees and employers each, per program.

TERMINOLOGY

Throughout this report the following definitions and abbreviations will be used:

(1) Competency - ability to perform a task

(2) Mathematics Competency - A statement that specifies a mathematical activity to be performed

(3) Advisory Committee - Advisory committees exist for every occupational program at Northeast Wisconsin Technical Institute. Each advisory committee consists of equal numbers of employers and employees in the occupation. These committees give advice and assistance in evaluating the effectiveness of the program. They also give advice on methods of instruction, on the development of relevant instructional material, and on the current demands of business, industry, and governmental institutions.

(4) VTAE - Vocational Technical and Adult Education

(5) V - Vocational program usually one year in duration

(6) AD - Associate Degree program - two years in length

(7) WBVTAE - Wisconsin Board of VTAE

(8) DPI - Wisconsin Department of Public Instruction

(9) UW System - University of Wisconsin System

(10) NWTI - Northeast Wisconsin Technical Institute at Green Bay

(11) NCSM - National Council of Supervisors of Mathematics

(12) Cluster - A group of occupations which are similar. For example, auto service trades, electrical trades, construction trades, sales or marketing, etc.

(13) R - Rating means

(14) F - Frequency means

(15) RF - Rating and frequency means

(16) *R - Significant difference between employer and employee means on rating

(17) *F - Significant difference between employer and employee means on frequency of use

(18) *RF - Significant difference between employer and employee means on rating and frequency of use

(19) OMIT - Math task should be deleted from list

(20) SPSS - Statistical Package for Social Sciences

(21) CORE - Common to all occupations

(22) O - Omit from core

(23) X - Math task essential to occupation

CHAPTER II METHODOLOGY

ASSESSMENT

The VTAE Districts have some existing survey data on mathematics competencies which were reviewed and synthesized into this study. The sources that were consulted included:

(1) A Welding Mathematics Survey conducted at North Central Technical Institute studied the employer and employee expectations of welding mathematics competencies;

(2) A study, Mathematics Skills for Selected Health Technologies Presentation of Data and Findings by Keith J. Roberts from Milwaukee Area Technical College, ascertained the mathematical needs of selected health technologies. This study surveyed employers and employees in March of 1980;

(3) A field study, Mathematical Tasks as Related to Police Work in 1973 by Bruce Koopika, at Northeast Wisconsin Technical Institute surveyed employers and employees expectations of mathematics competencies; and

(4) A study, Industrial Math Curriculum Project, was conducted by Mel Peterson and Dennis Bauer, at Waukesha County Technical Institute in January 1979. In this project, a profile of mathematics competencies for eight vocational programs was developed from occupational and mathematics instructor inputs.

The following two position papers proved to be helpful documents:

(1) The position paper Mathematics for Vocational-Technical Occupational Preparation was prepared jointly by WBVTAE and DPI on October 31, 1978; and

(2) The National Council of Supervisors of Mathematics Position Paper on Basic Mathematical Skills was prepared by a task force of NCSM.

The following articles served to be useful as a source of mathematics skills and conceptual ideas:

(1) An article, Teacher Perceptions of Basic Mathematics Skill Needs In Secondary Vocational Education by Thomas E. Long and Edwin L. Herr, was printed in the Mathematics Teacher on January 1973;

(2) An article, What Math Should All Twelfth Graders Know by Gail Burrill was printed by DPI in December 1976; and

(3) An article, Confessions of a Reformed Math Teacher by Dorothy R. Bleyer was printed in School Shop in February 1980;

(4) A text, Mathematics Behaviorial Objectives by Flanagen, Mager, and Shanner was printed by Westinghouse Learning Corporation in 1971. This book was a rich source of mathematics tasks.

Texts and course outlines presently used in the VTAE system were also consulted.

From these sources a preliminary competency list was developed by the project team of three mathematics instructors at NWTI. Revisions were made after consulting with the occupational instructors at NWTI.

A listing of mathematics competencies resulted which is divided into seven general skill areas: arithmetic, mensuration, algebraic, trigonometric statistical, computer and calculus. The master list of mathematics competencies appears in Appendix A on page 52.

The master list of mathematics competencies was used as a screening device in the development of the survey instruments. The master list was used to activate the methodology described in Chapter 2. The occupational instructors and their advisory committees used the master list in determining the mathematics competencies essential for their program.

RESEARCH DESIGN AND MODEL

The project was conducted in two phases. The first phase consisted of an assessment of existing mathematics competencies, a structuring of a master list of mathematics competencies into logical groupings, and an articulation and synchronization of the mathematics competency list with occupational instructors and their advisory committees. The second phase entailed the development of a survey instrument for each occupation using input from occupational instructors and advisory committees. The survey instrument measured frequency of use and level of need of performance for each mathematics competency. Satisfaction was also measured. The results of the survey were analyzed and reported in phase two.

The following research design was used.
Let,

X_{im} - (denote treatment of educational program i at VTAE District m)

O_{im} - (denote measurement with survey instrument developed for program i)

G_{im} - (denote graduate of occupational program i in VTAE District m)

E_{im} - (denote employers of graduates)

R - (denote random selection)

At least two comparable groups (G_{ij}) and (G_{il}) graduates of program X_{im} in at least two distinct VTAE Districts were randomly selected from current mailing lists of 1977, 1978, 1979 graduates. (If an insufficient number of graduates exist, the who list will serve as the sample.) The employers of these graduates were also surveye

Symbolically, it may be diagrammed as follows:

$R \quad G_{ij}: \quad X_{ij} \quad O_{ij}$

$R \quad G_{il}: \quad X_{il} \quad O_{il}$

$E_{ij}: \quad O_{ij}$

$E_{ij}: \quad O_{il}$

This basic cross sectional design, and after only without control groups, was used on each occupational program. Comparative statistics were used (Statistical Package for Social Sciences) on the measurements obtained. This design validated and refined the expectation data on the Mathematics Competencies peculiar to an occupational program. The survey instrument (O_i) measured frequency of use, and need of performance on semantic differential scales. Satisfaction was also measured. A table of specifications included a match up of a master list of Mathematics Competencies with the item numbers of the survey instrument(s). This served as a link to determine those Mathematics Competencies which are common to all the occupations surveyed.

Appendix B contains a summary network of the project. Appendix C consists of a description of the events on the summary network. Appendix B is on page 61 and Appendix C is on page 62.

ORGANIZATION

The project was completed with the aid of a team of mathematics instructors from NWTI, comprising Bruce Koopika, Project Director, Bob Bilot and Dannis Schouten. Each member of the team was assigned to work with five occupational instructors, five programs and five advisory committees at NWTI.

The mathematics instructors and occupational instructors, working together, accomplished the following objectives.

(1) To list the mathematics competencies for the occupational program.

(2) To evaluate the mathematics competencies with the advisory committee asking them to identify the topics that are essential to the program, the ones that would be nice to know and those which could be eliminated.

(3) To identify applied problems in the occupational program for the math competencies listed.

(4) To sequence the mathematics competencies as to need.

Details of the organizational plan for the project are included in Appendix D on page 64.

POPULATION

The population consisted of employees, 1977, 1978 and 1979 graduates of fifteen occupational programs in at least two distinct VTAE Districts and the employers of these graduates.

The next challenge to accomplish the project was to select the districts, occupations and groups to survey. The criteria used in the selection process was to consider the types of programs at NWTI which would satisfy the requirements in Chapter I and which would impact on the achievement of the objectives. The number of program enrollments and graduates was a major criteria used. These criteria has to be satisfied in at least two VTAE Districts. The districts selected must conduct longitudinal follow-up studies in order to have current addresses of graduates. The district must offer a placement service for graduates in order to have current addresses of employers of their graduates.

The programs and districts selected appear in Table I on page 10.

The districts involved provided the mailing lists of the 1977, 1978 and 1979 graduates and employers of these graduates. Assurance of the confidentiality of this information was given.

TABLE I PROGRAMS & DISTRICTS

NO.	PROGRAMS	TYPE	DISTRICTS	MATH INSTRUCTOR
1	Account Clerk	V	Green Bay & Eau Claire	Bilot
2	Accounting	AD	Green Bay & Eau Claire	Bilot
3	Mechanical Drafting	V	Marinette & Eau Claire	Bilot
4	Mechanical Design	AD	Green Bay & Eau Claire	Bilot
5	Machine Tool	V	Green Bay & Eau Claire	Bilot
6	Auto Mechanics	V	Green Bay & Eau Claire	Koopika
7	Auto Parts	V	Green Bay & Madison	Koopika
8	Auto Body	V	Green Bay & Eau Claire	Koopika
9	Diesel Mechanics	V	Sturgeon Bay & Eau Claire	Koopika
10	Welding	V	Green Bay & Eau Claire	Koopika
11	Retail Sales	V	Green Bay & Wausau	Schouten
12	Sales Management	AD	Green Bay & Eau Claire	Schouten
13	Electricity	V	Green Bay	Schouten
13	(Electrical Power)	V	Eau Claire	
14	Instrumentation	AD	Green Bay	Schouten
14	(Industrial Electronics)	AD	Eau Claire	
15	Wood Technics (Carpenters)	V	Green Bay & Eau Claire	Schouten

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SURVEY DESIGN

Based on the objectives in Phase I of this study, the project team (developed a unique survey instrument for each occupational program/cluster) from inputs provided by the occupational instructors and their advisory committees. These instruments contain a list of mathematical tasks essential to function in that occupation. These tasks were rated on level of performance and frequency of use. Satisfaction was also rated.

A standard format was used to facilitate the computer analysis. The instruments were coded to track districts, employers and employees. The instruments were designed for ease of reading and with a consistent response pattern. The mathematical tasks listed on each instrument were stated in terms which are used in the occupation involved whenever feasible. The instruments were also designed for ease of keypunching. Some programs were clustered together using the same survey instrument. The auto service occupations formed one cluster and the sales occupations formed another. The rest of the survey instruments were unique.

The survey instruments are in Appendix E on page 66.

SURVEY ANALYSIS

The data from the survey instruments were keypunched and verified. The computer at the University of Wisconsin, Green Bay, was used to analyze the data with SPSS (Statistical Package for Social Sciences). An analysis into means, frequency distribution, t-test, and cross tabulation was made. Each survey instrument was a separate computer run. The auto service cluster composed an additional computer run as a group. Also, retail sales and sales management was run as a cluster.

The surveys sent and returned by program are illustrated in Table 2 page 13.

Given the two populations employers and employees with means μ_1 and μ_2 on a math task, respectively, the problem is to use the t-test to show that there is no significant difference between the employer and employee mean on that math task.

The following is the set up of this problem in formal statistical terms.

(1) The null hypotheses H_o: $\mu_1=\mu_2$

(2) Alternative hypotheses H_1: $\mu_1\neq\mu_2$ are formulated on each question. For both rating and frequency means.

(3) The significance level $\alpha = .05$ is chosen.

(4) The probability associated with t is computed by SPSS. This is a two-tailed probability.

(5) H_o is rejected if the two-tailed probability for H_o is less than $\alpha = .05$ chosen in Step 2.

If there is no significant difference on the math task means, then it follows that the perception of the mathematical task by employers and employees was not significantly different.

The results of the computer analysis are presented through Tables in Chapter III - Study Results.

The appearance of the following symbols on the right hand side of a Table in Chapter III, indicates a perceptual difference on the math task; otherwise the perceptions on a math task are not significantly different for employer and employees.

LET,

* - Reject null hypothesis and accept alternate hypothesis

R - Rating Mean

F - Frequency Mean

RF - Rating and Frequency Mean

Therefore, *R implies there is a significant difference between rating means, *F implies there is a significant difference between frequency means, and *RF implies there is a significant difference between both rating and frequency means.

OMIT on the right hand side of the table means to delete that math task from the list.

The criteria for an OMIT on a math task is low means (less than 2.5) coupled with low frequency of use means. At times a math task with low means is necessary to perform another math task.

Each survey instrument had the same open ended questions. These included:

1) What is your job description or job title?

2) Please include here any additional mathematics tasks that you believe are needed.

3) Please include here any further general comments you may have.

All comments to the open ended questions were separated by employee, employer and type of program. These are included in Appendix F.

Each survey instrument rated satisfaction. The satisfaction questions were:

1) If you are an employer/supervisor, are you satisfied with the mathematical performance of your employees (technical institute graduates)?

2) If you are an employee are you satisfied with your mathematical performance on the job?

3) If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

The frequency of response to satisfaction questions are included in Tables 20,21, and 22.

TABLE 2 SURVEYS SENT AND RETURNED BY PROGRAM

PROGRAM	SURVEYS MAILED	SURVEYS RETURNED	PERCENT RETURNED	SURVEYS MAILED TO EMPLOYERS	SURVEYS RETURNED EMPLOYERS	PERCENT RETURNED EMPLOYERS	SURVEYS MAILED TO EMPLOYEES	SURVEYS RETURNED EMPLOYEES	PERCENT RETURNED EMPLOYEES
1	141	48	34%	61	23	38%	80	25	31%
2	162	62	38%	82	34	41%	80	28	35%
3	43	17	40%	15	8	53%	28	9	32%
4	118	36	31%	48	11	23%	70	25	36%
5	133	39	29%	53	20	38%	80	19	24%
6	134	30	22%	54	18	33%	80	12	15%
7	83	15	18%	35	8	23%	48	7	14%
8	140	26	19%	60	15	25%	80	11	14%
9	128	31	24%	48	15	31%	80	16	20%
10	167	27	16%	85	17	20%	82	10	12%
11	78	18	23%	35	10	29%	43	8	19%
12	139	34	24%	59	24	41%	80	10	12%
13	152	28	18%	72	14	19%	80	14	18%
14	104	22	21%	34	7	21%	70	15	21%
15	117	26	22%	42	10	24%	75	16	21%

Total Surveys Sent = 1839

Total Completed Surveys Returned =459

% Returned = $\frac{459}{1839}$ =25%

CHAPTER III STUDY RESULTS

The results of this project will be presented with its corresponding outcome as stated in Chapter 1 BACKGROUND.

OUTCOME (1): An improved model or set of mathematics competencies which can be used to develop VTAE mathematics curriculum for any occupation/cluster. The model developed is Chapter 2 METHODOLOGY. The set of mathematics competencies developed to activate the model are illustrated in Appendix A on page 52.

OUTCOME (2): A profile of mathematics competencies which discriminates those competencies which are common to all occupations/clusters and those which are peculiar to specific occupations/clusters. The profile matrix mathematics competencies from Appendix A vs occupations listed in Table 1 appears in Appendix G on page 175.

The following tables were developed for each program from the computer output. There is a table on rating and frequency means by employee and employer for each math task on the survey for that program. Also, tables on satisfaction with math performance and preparation illustrated. The profile matrix in Appendix G was developed by coupling the tables with the mathematics competencies listed in Appendix A.

The numbers in the task column in the tables correspond with the survey question numbers in Appendix E. While reading the table for a particular program, the survey instrument for that program must be read at the same time. Also, recall the meanings of the symbols on the right hand side of the tables. (See page 12)

A comparison of the combined auto service with individual auto service occupations shows different results. This is also true of the combined sales. This could tend to give validity to the statement, "there exists a unique list of mathematics skills that are essential for a person to exhibit in order to perform or function successfully in an occupation."

Since there are two distinct means on both rating and frequency of use, a rank ordering which is common in these types of studies is not feasible. A statistical test does not exist to check the significance or validity of the rank ordering of tasks except replication in an expanded study. All of the math tasks listed in a table except the OMIT tasks will be used in the math curriculum for that program. If the perceptions between the employee and employer on a given task was not significantly different then one could conclude that the task was valid and needed. A significant difference in perception on a given math task does not always imply that the math task should be deleted.

Upon analyzing the satisfaction Tables 20-22 it appears that employers and employees are satisfied with math performance on the job and preparation at VTAE school.

In reading Appendix G, profile matrix, the numbers in the left hand column represent mathematics competencies from the master list in Appendix A, and the horizontal numbers represent the fifteen occupational program areas.

TABLE 3 ACCOUNT CLERK

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
1	2.91	2.55	1.88	1.82	
2	2.68	2.59	1.70	1.82	
3	4.00	4.36	2.56	2.77	
4	3.87	4.45	2.54	2.82	
5	2.74	2.86	1.88	1.91	
6	4.91	4.91	3.00	3.00	
7	3.39	4.05	2.25	2.44	
8	-	-	-	-	
9	3.30	3.74	2.21	2.39	
10	2.74	3.17	1.96	2.09	
11	3.26	3.96	2.12	2.35	
12	2.09	3.04	1.42	1.96	*RF
13	1.96	1.96	1.38	1.26	OMIT
14	3.52	3.36	2.17	2.14	
15	2.65	3.30	1.71	1.96	
16	3.17	3.65	2.04	2.26	
17	2.56	2.70	1.67	1.78	
18	3.39	3.65	2.17	2.22	
19	2.87	3.35	1.92	2.09	
20	2.87	2.70	1.83	1.61	
21	2.96	2.83	1.96	1.74	
22	3.09	2.70	2.00	1.65	
23	3.26	2.83	2.00	1.61	
24	2.04	2.91	1.33	1.78	*F
25	2.78	3.35	1.92	2.00	
26	2.00	2.61	1.29	1.65	
27	1.82	1.95	1.13	1.32	OMIT
28	2.09	2.87	1.33	1.78	*F
29	2.75	2.30	1.72	1.56	
30	3.71	3.35	2.20	2.04	
31	1.91	2.17	1.29	1.35	OMIT
32	3.00	3.48	1.88	2.05	
33	2.39	2.59	1.58	1.70	
34	1.56	1.97	1.12	1.35	OMIT
35	2.92	3.56	1.80	2.09	
36	2.79	3.39	1.80	2.17	

#8 - was inadvertently skipped

TABLE 4 ACCOUNTING

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN			FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER		EMPLOYEE	EMPLOYER	
1	3.29	3.24		2.07	2.21	
2	3.29	3.06		2.11	2.21	
3	3.57	3.71		2.36	2.53	
4	4.61	4.56		2.86	2.79	
5	4.68	4.50		2.86	2.76	
6	4.79	4.62		2.89	2.85	
7	2.61	2.44		1.82	1.76	
8	1.65	1.62		1.22	1.35	OMIT
9	1.42	1.41		1.11	1.24	OMIT
10	3.31	3.03		2.26	2.06	
11	4.85	4.62		2.89	2.82	
12	4.62	4.41		2.74	2.79	
13	4.04	3.68		2.41	2.35	
14	4.35	4.15		2.59	2.65	
15	3.42	3.42		2.15	2.21	
16	2.92	3.26		1.78	2.09	
17	2.38	1.82		1.59	1.52	OMIT
18	2.31	1.94		1.52	1.55	OMIT
19	1.92	1.55		1.33	1.30	OMIT
20	2.23	2.26		1.52	1.55	OMIT
21	2.19	2.15		1.56	1.47	OMIT
22	2.81	3.00		1.93	2.00	
23	4.22	3.94		2.56	2.68	
24	3.54	3.74		2.22	2.38	
25	3.48	3.47		1.93	2.29	*F
26	3.89	3.71		2.25	2.44	
27	3.26	3.41		2.00	2.26	
28	3.74	3.03		2.21	2.09	
29	3.44	3.47		1.96	2.38	*F
30	3.33	3.24		1.92	2.18	
31	3.67	3.62		2.07	2.44	
32	4.14	3.85		2.46	2.50	
33	3.59	3.76		2.07	2.32	
34	3.85	3.85		2.29	2.56	
35	3.63	3.53		2.11	2.38	
36	3.22	3.15		2.00	2.06	
37	3.48	3.35		1.96	2.24	
38	3.22	3.09		1.82	2.06	
39	3.15	2.53		1.75	1.74	
40	2.48	2.18		1.39	1.53	OMIT
41	3.48	3.35		2.00	2.18	
42	2.33	2.15		1.36	1.44	OMIT
43	2.89	2.94		1.61	1.91	
44	2.19	1.97		1.26	1.32	OMIT
45	2.04	2.21		1.40	1.56	OMIT
46	2.33	2.41		1.56	1.56	OMIT
47	2.17	1.97		1.36	1.32	OMIT
48	2.36	2.21		1.50	1.44	OMIT

TABLE 4 ACCOUNTING

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY (Continued)

MATH TASK	RATING - MEAN			FREQUENCY - MEAN	
	EMPLOYEE	EMPLOYER		EMPLOYEE	EMPLOYER
49	3.32	3.15		1.85	2.06
50	2.72	2.44		1.58	1.62
51	3.08	3.09		1.85	2.12
52	3.31	3.18		2.12	2.24
53	2.76	2.62		1.56	1.65

TABLE 5 **MECHANICAL DRAFTING**

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN			FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER		EMPLOYEE	EMPLOYER	
1	4.67	4.62		2.78	2.88	
2	3.89	4.12		2.44	2.62	
3	4.89	5.00		2.89	3.00	
4	4.67	4.50		2.78	2.62	
5	3.89	4.71		2.44	2.86	
6	4.78	4.62		2.89	2.75	
7	4.44	4.14		2.67	2.43	
8	3.38	4.38		2.25	2.62	*R
9	4.50	4.88		2.75	2.88	
10	4.62	4.50		2.88	2.75	
11	3.50	4.00		2.38	2.57	
12	2.86	3.86		2.00	2.29	
13	1.88	3.57		1.62	2.14	*R
14	2.00	3.75		1.88	2.25	*R
15	2.75	3.75		2.00	2.25	
16	2.50	4.38		2.00	2.50	*R
17	3.12	4.62		2.12	2.75	*RF
18	2.38	4.50		1.88	2.75	*RF
19	2.88	4.38		2.12	2.38	*R
20	4.38	5.00		2.62	3.00	
21	3.12	4.38		2.12	2.62	*RF
22	2.50	3.62		1.88	2.25	
23	2.38	3.62		1.88	2.12	
24	2.25	3.38		1.75	2.00	
25	3.22	4.38		2.11	2.38	*R
26	3.00	4.50		2.00	2.62	*RF
27	2.22	4.00		1.67	2.43	*RF
28	2.56	3.57		1.67	2.29	
29	2.67	3.88		1.78	2.38	
30	4.22	4.29		2.56	2.71	
31	2.67	3.43		1.78	2.14	
32	2.22	2.12		1.67	1.38	
33	3.22	5.00		2.22	3.00	*RF
34	3.22	5.00		2.22	2.88	*RF
35	3.33	5.00		2.33	3.00	*RF
36	2.00	3.29		1.67	2.00	*RF
37	2.56	4.50		1.78	2.62	*RF
38	2.44	5.00		1.78	2.88	*RF
39	2.89	4.62		2.11	2.75	*R
40	2.56	4.50		2.00	2.75	*RF
41	1.25	2.71		1.25	2.00	*F
42	1.50	2.71		1.50	1.71	
43	1.62	2.57		1.50	1.71	OMIT
44	1.12	2.43		1.12	1.71	OMIT
45	2.12	3.12		1.50	2.00	
46	2.12	2.75		1.62	1.75	

TABLE 6

MECHANICAL DESIGN

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN			FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER		EMPLOYEE	EMPLOYER	
1	4.52	4.36		2.92	2.73	
2	3.84	3.64		2.24	2.36	
3	3.08	3.27		1.92	2.27	
4	3.16	3.82		2.00	2.27	
5	3.04	3.73		1.84	2.36	
6	2.92	3.45		1.62	2.27	*F
7	3.24	4.36		2.12	2.73	*RF
8	2.92	3.6		1.83	2.40	*F
9	2.88	3.09		1.68	2.00	
10	3.68	3.91		2.24	2.45	
11	4.08	4.45		2.52	2.56	
12	3.16	3.09		1.96	2.00	
13	3.88	4.27		2.36	2.64	
14	3.80	4.18		2.44	2.64	
15	3.21	3.18		2.04	2.18	
16	2.76	3.64		1.68	2.27	*F
17	2.68	3.55		1.68	2.27	*F
18	3.24	4.00		1.96	2.36	
19	3.16	3.64		1.96	2.18	
20	3.39	4.40		2.13	2.70	
21	2.30	3.00		1.57	1.91	
22	2.16	2.55		1.32	1.82	*F
23	4.16	4.36		2.60	2.64	
24	4.08	4.00		2.52	2.27	
25	4.16	3.70		2.60	2.40	
26	2.68	3.27		1.80	2.00	
27	4.36	4.36		2.72	2.64	
28	4.08	4.36		2.60	2.64	
29	4.17	4.36		2.56	2.73	
30	3.84	4.36		2.44	2.64	
31	3.72	4.00		2.28	2.36	
32	3.68	3.91		2.28	2.36	
33	4.12	4.18		2.52	2.55	
34	4.60	4.36		2.76	2.64	
35	4.12	3.73		2.48	2.27	
36	2.60	3.09		1.4	2.00	*F
37	3.04	3.55		1.76	2.09	
38	3.04	3.64		1.80	2.27	
39	3.96	4.09		2.44	2.64	
40	2.04	3.09		1.28	2.00	*RF
41	2.44	3.00		1.52	1.91	
42	3.28	3.18		1.72	1.82	
43	2.73	3.18		1.70	2.18	
44	2.75	3.09		1.64	2.09	
45	2.68	2.91		1.56	1.91	
46	2.44	2.73		1.40	1.91	*F
47	2.79	3.00		1.50	2.00	*F

TABLE 7 MACHINE TOOL

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
1	4.42	4.60	2.68	2.80	
2	3.68	4.32	2.26	2.60	
3	4.90	4.90	3.00	3.00	
4	4.26	4.75	2.68	2.95	*F
5	4.39	4.75	2.61	2.85	
6	4.74	4.90	2.90	3.00	
7	3.79	4.15	2.37	2.60	
8	4.33	4.68	2.67	2.90	
9	4.78	4.95	2.83	3.00	
10	3.61	3.35	2.33	2.20	
11	4.06	3.84	2.44	2.42	
12	2.61	3.05	1.50	1.95	*F
13	2.28	1.90	1.33	1.60	OMIT
14	2.50	2.00	1.44	1.65	
15	3.06	2.47	1.78	1.84	
16	3.28	3.42	1.83	2.21	
17	2.83	3.42	1.61	2.26	*F
18	2.72	3.31	1.61	2.21	*F
19	2.56	2.61	1.50	1.89	
20	3.44	4.05	2.06	2.55	*F
21	3.28	3.70	1.83	2.40	*F
22	3.17	3.85	1.94	2.45	*F
23	2.42	3.35	1.47	2.20	*RF
24	4.05	4.25	2.37	2.55	
25	2.79	3.65	1.58	2.20	*RF
26	2.74	2.74	1.53	2.00	*F
27	2.53	2.37	1.37	1.74	*F
28	3.10	2.90	1.63	2.05	*F
29	2.84	3.40	1.74	2.10	
30	2.90	3.30	1.58	2.20	*F
31	3.74	4.45	2.42	2.75	*R
32	3.26	3.80	1.95	2.35	
33	5.00	4.80	3.00	3.00	
34	4.26	4.32	2.68	2.79	
35	4.00	4.32	2.39	2.74	
36	3.00	3.79	1.84	2.47	*F
37	2.84	3.67	1.74	2.39	*F
38	2.21	2.32	1.32	1.68	OMIT
39	2.16	2.26	1.26	1.63	OMIT
40	2.05	2.47	1.21	1.79	*F OMIT
41	3.17	3.55	1.89	2.25	
42	2.53	2.74	1.29	1.79	*F
43	2.47	2.32	1.41	1.53	OMIT
44	2.24	2.10	1.18	1.47	OMIT
45	2.53	2.32	1.53	1.63	
46	2.24	2.11	1.29	1.58	OMIT
47	2.24	2.05	1.17	1.53	OMIT
48	4.06	3.95	2.41	2.63	

TABLE 7 MACHINE TOOL

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY (Continued)

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
49	3.47	3.61	2.12	2.33	
50	2.94	3.28	1.53	2.22	
51	2.65	3.22	1.47	2.11	*F
52	2.47	3.00	1.29	1.95	*F
53	2.82	3.50	1.59	2.30	*F
54	3.41	3.53	1.71	2.32	*F
55	2.19	2.42	1.19	1.74	*F OMIT
56	3.39	3.45	1.72	2.30	*F
57	3.22	3.60	1.61	2.35	*F
58	3.11	3.47	1.56	2.32	*F
59	2.78	2.84	1.56	2.00	
60	2.24	1.61	1.24	1.22	OMIT
61	2.78	3.05	1.61	1.95	
62	2.50	3.16	1.61	1.95	
63	2.89	3.42	1.61	2.16	
64	2.69	2.94	1.38	1.94	*F

TABLE 8 **AUTOMOTIVE MECHANICS**

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
1	4.83	4.67	3.00	2.94	
2	2.75	2.78	3.92	3.94	
3	2.50	2.61	4.00	3.28	
4	4.00	3.28	2.42	2.17	
5	3.25	3.06	2.08	2.00	
6	2.92	2.94	1.92	1.89	
7	4.50	3.50	2.58	2.39	
8	4.50	4.00	2.67	2.67	
9	3.42	3.06	2.08	2.11	
10	3.83	3.83	2.42	2.33	
11	3.08	3.28	1.92	2.06	
12	3.17	3.50	2.00	2.33	
13	3.67	3.67	2.17	2.33	
14	2.83	2.94	2.00	1.83	
15	2.58	3.12	1.75	2.00	
16	1.50	1.89	1.17	1.53	OMIT
17	2.33	3.29	1.75	2.06	
18	2.17	2.50	1.58	1.78	
19	2.17	2.83	1.67	1.83	
20	3.00	3.44	1.83	2.17	
21	2.17	2.38	1.33	1.72	OMIT
22	1.83	2.11	1.33	1.67	OMIT
23	4.42	4.67	2.50	2.83	
24	1.67	2.39	1.33	1.56	OMIT
25	4.17	4.00	2.58	2.67	
26	3.33	3.56	2.08	2.28	
27	1.92	2.17	1.42	1.56	OMIT
28	4.67	4.72	2.92	2.89	
29	3.75	4.22	2.25	2.56	
30	2.00	2.11	1.42	1.56	OMIT
31	2.17	2.61	1.50	1.78	
32	1.92	2.11	1.33	1.61	OMIT
33	1.92	2.06	1.33	1.56	OMIT
34	2.00	2.11	1.42	1.50	OMIT
35	2.08	2.39	1.50	1.78	OMIT
36	2.08	2.5	1.42	1.78	
37	2.33	2.67	1.58	2.00	
38	3.83	4.44	2.08	2.72	*F
39	1.75	2.17	1.33	1.72	OMIT
40	1.83	2.39	1.33	1.72	OMIT
41	3.25	3.78	1.83	2.17	
42	1.67	2.67	1.33	1.83	*RF
43	2.25	2.94	1.58	2.00	
44	2.00	2.72	1.50	1.83	
45	3.25	3.78	1.83	2.28	
46	2.92	3.28	1.75	2.17	
47	2.08	2.50	1.33	1.71	
48	2.08	2.22	1.42	1.59	OMIT

TABLE 8 **AUTOMOTIVE MECHANICS**

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY (Continued)

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
49	3.00	3.72	1.75	2.28	*F
50	2.92	3.22	1.75	2.06	
51	4.25	4.50	2.58	2.61	
52	1.92	2.33	1.25	1.47	OMIT
53	1.75	2.22	1.67	1.35	OMIT
54	1.58	1.83	1.00	1.29	OMIT
55	2.58	2.61	1.58	1.82	
56	2.08	2.44	1.42	1.71	
57	1.58	2.61	1.17	1.78	*RF
58	1.67	2.33	1.25	1.61	OMIT
59	2.42	2.83	1.75	1.83	
60	3.58	3.33	2.25	2.06	
61	2.83	3.17	1.75	2.00	
62	2.42	2.89	1.50	1.94	
63	2.67	2.78	1.58	1.89	
64	2.33	2.78	1.42	1.89	
65	2.50	3.00	1.42	2.06	*F
66	2.83	2.39	1.75	1.67	
67	2.83	3.56	1.75	2.33	*F
68	2.25	2.50	1.25	1.76	
69	3.17	3.56	1.92	2.44	
70	3.50	2.61	1.83	1.71	
71	3.17	2.94	1.83	1.94	
72	3.25	3.67	2.08	2.29	
73	3.33	3.11	1.83	2.06	
74	2.33	2.83	1.58	1.88	
75	2.58	2.78	1.50	1.88	

TABLE 9 **AUTO PARTS**

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN			FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER		EMPLOYEE	EMPLOYER	
1	4.86	4.75		3.00	3.00	
2	5.00	4.62		3.00	3.00	
3	4.86	4.50		3.00	2.75	
4	3.14	3.88		2.28	2.38	
5	2.29	3.25		1.86	2.12	
6	2.14	2.38		1.86	1.75	
7	3.00	3.62		1.86	2.50	
8	4.14	4.38		2.57	2.50	
9	3.33	2.62		2.17	1.88	
10	3.50	2.88		2.33	2.25	
11	3.33	2.62		.233	1.75	
12	3.00	2.88		2.00	2.00	
13	3.60	2.57		2.20	1.71	
14	3.83	2.25		2.50	1.75	
15	4.67	4.38		3.00	2.75	
16	1.67	1.25		1.17	1.25	OMIT
17	3.17	3.12		2.00	2.12	
18	2.83	2.25		1.83	1.75	
19	3.33	2.75		2.17	1.88	
20	2.33	2.88		1.67	1.88	
21	1.67	1.50		1.33	1.25	OMIT
22	1.67	1.38		1.33	1.25	OMIT
23	3.83	2.12		2.33	1.88	
24	2.50	1.12		1.67	1.12	OMIT
25	4.50	3.00		2.83	2.25	
26	3.50	2.75		2.17	1.88	
27	2.00	1.00		1.50	1.00	OMIT
28	4.00	4.25		2.50	2.62	
29	3.29	3.62		2.00	2.12	
30	1.57	1.12		1.29	1.12	OMIT
31	2.14	1.75		1.57	1.38	OMIT
32	1.43	1.88		1.29	1.62	OMIT
33	1.43	1.00		1.29	1.00	OMIT
34	2.00	1.00		1.43	1.00	OMIT
35	1.57	1.38		1.29	1.25	OMIT
36	1.57	1.38		1.29	1.25	OMIT
37	2.57	2.00		1.43	1.62	
38	4.43	3.25		2.57	2.12	
39	1.57	1.00		1.14	1.00	OMIT
40	2.28	1.00		1.57	1.00	*R OMIT
41	1.86	1.25		1.14	1.25	OMIT
42	1.29	1.00		1.14	1.00	OMIT
43	1.71	1.25		1.29	1.25	OMIT
44	2.14	1.12		1.43	1.12	OMIT
45	3.28	1.75		2.00	1.50	*R
46	2.57	2.00		1.57	1.50	
47	1.71	1.25		1.29	1.12	OMIT
48	1.57	1.12		1.29	1.12	OMIT

TABLE 9 AUTO PARTS

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY (Continued)

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
49	4.00	2.37	2.50	1.88	*R
50	3.50	2.25	2.00	1.75	
51	4.50	4.00	2.67	2.38	
52	1.83	1.00	1.17	1.00	OMIT
53	1.33	1.00	1.17	1.00	OMIT
54	2.00	1.00	1.5	1.00	OMIT
55	2.17	1.38	1.33	1.12	OMIT
56	2.33	1.25	1.50	1.25	*R OMIT
57	3.83	2.50	2.33	2.12	
58	4.00	2.50	2.50	2.00	*R
59	3.33	2.75	2.00	1.88	
60	3.83	1.62	2.17	1.38	*R
61	5.00	4.12	2.67	2.62	
62	4.50	4.12	2.67	2.62	
63	4.50	3.88	2.67	2.50	
64	3.83	4.00	2.33	2.62	
65	3.50	2.62	2.17	1.75	
66	3.17	2.50	2.00	1.62	
67	5.00	4.00	3.00	2.62	
68	3.00	3.00	2.00	1.88	
69	4.17	3.62	2.50	2.50	
70	2.29	1.25	1.57	1.12	OMIT
71	2.43	1.62	1.57	1.38	OMIT
72	3.29	3.00	2.00	2.00	OMIT
73	2.00	1.38	1.71	1.25	OMIT
74	1.86	1.00	1.29	1.00	OMIT
75	2.14	1.00	1.29	1.00	OMIT

TABLE 10 AUTO BODY

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN			FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER		EMPLOYEE	EMPLOYER	
1	3.27	4.67		2.36	2.87	
2	4.00	4.80		2.73	2.87	
3	3.55	4.47		2.45	2.73	
4	2.73	3.73		2.18	2.20	*R
5	2.55	3.20		1.82	2.13	
6	2.27	2.47		1.82	1.80	
7	3.82	3.80		2.09	2.53	*F
8	2.91	4.07		2.18	2.60	*R
9	1.50	2.50		1.50	1.93	
10	2.60	3.14		1.90	2.14	
11	2.50	2.92		1.70	2.00	
12	2.40	3.36		1.90	2.36	
13	2.70	3.29		2.00	2.07	
14	2.50	3.21		1.80	2.21	
15	3.30	3.43		2.30	2.36	
16	1.30	1.57		1.10	1.29	OMIT
17	2.10	3.00		1.70	2.21	
18	1.60	2.64		1.30	1.93	*RF
19	1.60	2.64		1.30	1.93	*RF
20	1.70	2.50		1.40	1.93	*F
21	1.90	3.00		1.40	2.14	*F
22	1.70	2.64		1.30	1.79	
23	2.10	2.29		1.70	1.71	
24	1.30	2.57		1.20	1.86	*RF
25	2.60	3.36		2.10	2.21	
26	2.00	2.86		1.50	1.93	*F
27	1.40	2.36		1.30	1.79	*RF OMIT
28	3.30	4.29		2.50	2.71	
29	2.82	3.33		1.73	2.13	
30	1.55	2.27		1.18	1.80	*RF OMIT
31	1.64	1.53		1.36	1.20	OMIT
32	1.64	1.80		1.36	1.53	OMIT
33	1.45	1.40		1.18	1.07	OMIT
34	1.45	1.33		1.18	1.20	OMIT
35	1.73	2.00		1.36	1.67	OMIT
36	1.55	1.93		1.27	1.60	OMIT
37	1.73	2.26		1.45	1.73	OMIT
38	4.27	4.40		2.91	2.67	
39	1.91	2.40		1.36	1.60	OMIT
40	2.27	2.80		1.45	1.80	
41	3.45	3.33		2.18	2.20	
42	1.54	2.60		1.27	1.93	*RF
43	2.45	2.80		1.64	2.00	
44	2.27	2.73		1.45	1.87	
45	2.00	2.20		1.55	1.67	OMIT
46	1.82	2.20		1.36	1.60	OMIT
47	1.45	1.93		1.27	1.40	OMIT
48	1.64	1.67		1.36	1.33	OMIT

TABLE 10 **AUTO BODY**

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY (Continued)

MATH TASK	RATING - MEAN			FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER		EMPLOYEE	EMPLOYER	
49	2.00	3.36		1.60	2.21	*RF
50	1.80	2.64		1.60	1.79	
51	4.20	4.64		2.70	2.86	
52	1.70	2.36		1.50	1.64	OMIT
53	1.60	2.21		1.50	1.57	OMIT
54	1.20	1.71		1.10	1.21	OMIT
55	1.50	1.50		1.10	1.21	OMIT
56	2.00	1.86		1.40	1.50	OMIT
57	1.30	1.86		1.10	1.43	OMIT
58	1.20	1.93		1.00	1.57	*F OMIT
59	1.90	2.50		1.40	1.86	
60	1.80	2.57		1.30	1.64	
61	2.70	3.07		2.00	2.07	
62	2.90	3.29		2.10	2.14	
63	3.40	3.36		2.20	2.36	
64	3.40	3.36		2.20	2.36	
65	3.00	3.07		2.00	2.07	
66	3.20	2.93		1.90	1.93	
67	3.60	3.43		2.40	2.39	
68	2.20	3.00		1.60	2.07	
69	3.60	3.64		2.50	2.36	
70	1.64	1.60		1.27	1.33	OMIT
71	1.55	1.60		1.27	1.27	OMIT
72	2.27	3.00		1.64	2.13	
73	1.55	1.53		1.18	1.20	OMIT
74	2.09	2.06		1.45	1.53	OMIT
75	1.91	2.00		1.45	1.47	OMIT

TABLE 11 **DIESEL MECHANICS**

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN			FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER		EMPLOYEE	EMPLOYER	
1	3.94	4.67		2.50	2.80	
2	3.75	4.53		2.44	2.67	
3	3.31	4.33		2.19	2.60	*R
4	3.88	4.33		2.44	2.53	
5	3.80	4.00		2.25	2.40	
6	3.27	3.33		2.00	2.13	
7	4.38	4.27		2.75	2.60	
8	4.56	4.47		2.75	2.53	
9	3.19	3.60		2.06	2.33	
10	3.88	3.87		2.25	2.40	
11	3.69	3.47		2.06	2.13	
12	3.81	3.33		2.19	2.13	
13	3.94	4.00		2.19	2.33	
14	3.25	3.00		1.94	2.00	
15	2.75	2.67		1.62	1.93	
16	2.00	1.60		1.38	1.33	OMIT
17	3.19	2.87		2.06	1.87	
18	2.88	2.67		1.88	1.73	
19	3.13	2.87		2.00	1.93	
20	3.75	3.07		2.19	2.07	
21	2.50	3.43		1.62	2.21	*RF
22	2.50	2.79		1.62	1.85	
23	4.75	4.50		2.88	2.79	
24	2.50	2.57		1.69	1.71	
25	3.56	4.13		2.38	2.60	
26	3.19	2.86		2.06	2.00	
27	2.38	2.43		1.56	1.64	
28	4.75	4.40		2.94	2.80	
29	3.25	3.07		1.88	2.20	
30	2.56	2.43		1.62	1.50	
31	3.69	3.00		2.12	2.00	
32	2.88	2.20		1.62	1.60	
33	2.44	2.00		1.56	1.47	OMIT
34	2.94	2.20		1.69	1.53	
35	2.81	2.21		1.69	1.57	
36	3.12	2.21		1.75	1.57	
37	2.94	2.47		1.81	1.60	
38	4.12	3.53		2.50	2.07	
39	2.50	2.87		1.69	1.67	
40	2.81	3.13		1.81	1.93	
41	4.31	3.93		2.56	2.40	
42	2.56	2.71		1.62	1.79	
43	2.81	3.00		2.00	1.93	
44	2.50	3.07		1.56	2.13	*F
45	4.38	3.80		2.56	2.40	
46	4.25	3.53		2.44	2.20	
47	2.31	2.46		1.69	1.60	OMIT
48	2.06	2.13		1.44	1.60	

TABLE 11 **DIESEL MECHANICS**

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY (Continued)

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
49	2.69	2.93	1.69	1.87	
50	2.31	2.60	1.56	1.67	
51	4.69	4.13	2.94	2.53	*F
52	2.25	2.47	1.56	1.60	OMIT
53	2.06	2.07	1.31	1.53	OMIT
54	1.75	1.93	1.25	1.40	OMIT
55	3.00	2.67	1.75	1.67	
56	2.00	2.27	1.38	1.80	*F OMIT
57	1.56	1.60	1.12	1.33	OMIT
58	1.38	1.53	1.06	1.20	OMIT
59	2.50	2.67	1.75	1.87	
60	3.88	3.67	2.12	2.27	
61	2.69	2.13	1.69	1.67	OMIT
62	2.62	1.93	1.62	1.60	OMIT
63	2.56	1.87	1.50	1.53	OMIT
64	2.50	1.87	1.56	1.53	OMIT
65	1.94	1.73	1.25	1.40	OMIT
66	2.50	1.73	1.56	1.33	OMIT
67	2.62	2.27	1.62	1.60	
68	2.12	2.00	1.25	1.53	OMIT
69	3.44	2.73	2.00	1.93	
70	3.94	3.00	2.31	2.13	*R
71	4.06	2.80	2.25	2.00	*R
72	3.12	3.00	1.81	2.07	
73	4.44	3.53	2.31	2.13	*R
74	3.62	3.00	2.06	1.87	
75	3.44	2.80	1.81	1.93	

TABLE 12 WELDING

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
1	4.50	4.59	3.00	2.94	
2	4.40	4.47	2.80	2.94	
3	3.6	4.56	2.40	2.88	
4	4.70	4.35	2.90	2.82	
5	4.30	4.05	2.70	2.71	
6	3.20	3.53	2.20	2.35	
7	4.00	4.41	2.50	2.82	
8	4.10	3.88	2.60	2.47	
9	3.00	3.35	2.11	2.24	
10	3.56	3.71	2.22	2.47	
11	3.11	3.29	1.89	2.35	
12	3.22	3.29	2.11	2.35	
13	4.00	2.94	2.56	2.06	
14	3.33	2.53	2.11	1.94	
15	1.89	2.53	1.33	2.00	
16	1.56	1.88	1.22	1.59	OMIT
17	2.11	2.24	1.56	1.71	OMIT
18	1.78	1.65	1.33	1.41	OMIT
19	2.00	1.94	1.33	1.53	OMIT
20	2.78	3.12	1.78	2.29	
21	3.56	3.29	2.11	2.47	
22	3.44	2.76	2.00	2.06	
23	3.00	2.29	1.78	1.71	
24	2.67	2.62	1.89	2.06	
25	3.11	3.29	2.22	2.41	
26	2.60	2.12	1.60	1.47	OMIT
27	2.80	2.29	1.80	1.65	
28	4.60	4.71	2.90	2.94	
29	2.70	2.24	1.60	1.53	
30	2.90	2.18	1.70	1.59	
31	2.70	2.12	1.60	1.53	
32	2.30	2.35	1.60	1.71	OMIT
33	2.20	1.65	1.40	1.29	OMIT
34	2.20	1.65	1.30	1.24	OMIT
35	2.00	1.82	1.30	1.24	OMIT
36	2.00	1.53	1.30	1.24	OMIT
37	2.10	2.53	1.50	1.82	
38	1.90	2.53	1.30	1.88	*F
39	2.90	3.00	2.00	2.18	
40	3.30	3.06	2.20	2.18	
41	3.10	2.94	1.90	2.00	
42	2.60	2.82	1.80	1.94	
43	3.60	3.65	2.30	2.41	
44	4.20	3.18	2.60	2.18	
45	2.00	2.06	.133	1.53	OMIT
46	2.33	1.94	1.67	1.47	OMIT
47	2.00	1.82	1.44	1.41	OMIT
48	1.78	1.76	1.33	1.35	OMIT

TABLE 12 **WELDING**

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY (Continued)

MATH TASK	RATING - MEAN			FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER		EMPLOYEE	EMPLOYER	
49	2.67	2.47		1.78	1.76	
50	2.67	1.82		1.78	1.59	
51	3.78	4.06		2.44	2.53	
52	2.56	2.76		1.89	2.00	
53	2.11	2.53		1.44	1.76	
54	2.00	2.12		1.56	1.65	
55	1.44	1.38		1.22	1.19	OMIT
56	1.22	1.71		1.00	1.41	OMIT
57	1.33	1.65		1.00	1.35	OMIT
58	1.33	1.35		1.11	1.18	OMIT
59	2.11	1.88		1.56	1.47	OMIT
60	2.67	2.23		1.89	1.71	
61	2.11	2.24		1.56	1.94	OMIT
62	2.67	2.65		1.67	2.12	
63	2.11	2.06		1.44	1.65	OMIT
64	2.00	1.94		1.33	1.59	OMIT
65	2.50	3.12		1.71	2.41	*F
66	2.50	3.00		1.80	2.24	
67	2.20	2.47		1.50	1.88	OMIT

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN			FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER		EMPLOYEE	EMPLOYER	
1	4.00	4.50		2.62	2.90	
2	2.38	3.50		1.50	2.20	*F
3	2.25	3.20		1.38	2.00	*F
4	1.88	2.10		1.38	1.50	OMIT
5	2.50	3.70		1.75	2.40	
6	2.12	3.30		1.50	2.10	
7	2.50	3.70		1.75	2.50	
8	2.12	2.50		1.38	1.80	
9	2.88	3.70		2.00	2.50	
10	3.00	4.33		1.88	2.67	
11	3.12	3.20		2.00	2.20	
12	3.88	4.10		2.38	2.70	
13	3.88	4.60		2.38	2.90	
14	3.38	4.40		2.25	2.60	
15	3.50	4.50		2.25	2.80	
16	3.50	4.40		2.00	2.60	
17	2.25	3.70		1.38	2.30	*F
18	2.00	3.90		1.50	2.50	*RF
19	3.88	5.00		2.50	2.90	
20	3.12	4.00		1.88	2.50	
21	3.00	3.80		1.88	2.10	
22	3.12	4.10		1.88	2.60	
23	3.00	4.20		1.88	2.30	
24	2.88	3.90		1.88	2.60	
25	2.75	3.00		1.75	1.89	
26	2.88	3.60		2.00	2.30	
27	2.25	2.90		1.50	1.70	
28	1.75	2.20		1.12	1.50	OMIT
29	1.75	2.50		1.25	1.80	OMIT
30	1.88	2.50		1.25	1.70	OMIT
31	1.62	2.20		1.12	1.50	OMIT
32	1.75	2.00		1.12	1.20	OMIT
33	1.50	1.90		1.00	1.30	OMIT
34	3.00	3.30		2.00	2.00	
35	1.62	2.40		1.12	1.60	OMIT
36	2.00	3.00		1.25	2.00	*F
37	2.25	2.90		1.25	1.90	
38	1.88	2.80		1.12	1.80	*F
39	2.62	3.60		1.62	2.10	
40	3.25	3.80		2.00	2.30	
41	2.00	2.60		1.25	1.70	
42	1.75	1.90		1.12	1.40	OMIT
43	3.00	3.30		1.75	2.00	
44	2.88	3.70		2.00	2.00	
45	3.00	3.50		1.75	2.10	
46	3.12	3.50		1.75	2.20	
47	2.38	2.60		1.38	1.80	
48	2.25	2.40		1.38	1.50	OMIT

TABLE 13 RETAIL SALES

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY (Continued)

MATH TASK	RATING - MEAN			FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER		EMPLOYEE	EMPLOYER	
49	2.50	2.80		1.38	1.70	
50	2.12	2.30		1.25	1.50	OMIT
51	2.00	1.90		1.25	1.30	OMIT
52	2.00	2.50		1.12	1.60	*F OMIT
53	3.00	2.20		1.88	1.50	
54	2.62	2.50		1.75	1.40	

TABLE 14

SALES MANAGEMENT

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
1	4.90	4.25	3.00	2.88	
2	3.20	2.96	2.20	2.08	
3	3.10	2.88	1.90	2.08	
4	2.20	2.21	1.50	1.67	OMIT
5	3.80	3.21	2.30	2.17	
6	3.30	2.83	2.20	2.00	
7	4.20	3.83	2.70	2.50	
8	3.20	3.46	2.00	2.29	
9	3.40	3.56	2.10	2.26	
10	4.20	4.00	2.60	2.57	
11	3.40	3.43	2.40	2.30	
12	4.80	4.70	2.90	2.91	
13	4.30	4.43	2.60	2.83	
14	3.90	4.26	2.40	2.61	
15	4.40	4.65	2.60	2.87	
16	4.40	4.43	2.50	2.65	
17	3.70	3.83	2.40	2.39	
18	3.70	3.61	1.90	2.35	
19	4.50	4.22	2.70	2.65	
20	4.30	4.61	2.60	2.74	
21	3.50	3.61	2.00	2.30	
22	4.10	4.04	2.40	2.52	
23	4.00	4.22	2.40	2.52	
24	3.90	4.17	2.40	2.48	
25	3.40	3.00	2.10	1.91	
26	3.90	2.87	2.40	1.74	
27	2.60	2.61	1.60	1.74	
28	2.10	2.00	1.40	1.38	OMIT
29	2.60	1.79	1.70	1.25	OMIT
30	2.20	1.88	1.30	1.42	OMIT
31	1.60	1.46	1.10	1.20	OMIT
32	1.90	1.58	1.30	1.29	OMIT
33	1.90	1.75	1.40	1.42	OMIT
34	3.40	3.13	2.00	2.22	
35	2.30	2.08	1.40	1.46	OMIT
36	3.00	2.96	1.80	2.04	
37	2.90	2.62	1.70	1.83	
38	2.20	2.17	1.50	1.58	OMIT
39	3.30	3.75	1.90	2.29	
40	4.50	2.83	2.80	1.92	*RF
41	2.44	2.62	1.78	1.67	
42	2.60	2.42	1.60	1.62	
43	3.30	4.00	1.90	2.45	*F
44	3.80	4.21	2.10	2.54	
45	3.10	3.96	1.80	2.50	
46	2.90	4.04	1.70	2.50	
47	3.20	3.92	1.80	2.54	*F
48	3.20	4.09	1.80	2.61	*F

TABLE 14 SALES MANAGEMENT

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY (Continued)

MATH TASK	RATING - MEAN			FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER		EMPLOYEE	EMPLOYER	
49	2.90	4.12		1.80	2.50	*RF
50	2.20	3.25		1.30	2.17	*RF
51	2.10	2.33		1.40	1.71	OMIT
52	2.60	3.29		1.70	2.08	
53	3.40	3.46		1.90	2.17	
54	3.20	3.21		1.70	1.96	

TABLE 15 **ELECTRICITY (Electrical Power)**

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
1	3.57	4.21	2.50	2.50	
2	3.14	3.79	2.21	2.36	
3	3.29	4.00	2.21	2.43	
4	2.29	3.07	1.64	2.00	
5	2.79	3.07	2.00	1.93	
6	2.71	3.21	1.93	1.77	
7	2.36	2.46	1.64	1.69	OMIT
8	2.71	3.00	1.50	1.71	
9	2.71	2.54	1.64	1.69	
10	2.57	2.31	1.57	1.46	
11	2.64	2.57	1.57	1.71	
12	3.14	3.43	1.79	2.29	
13	2.71	2.86	1.71	1.62	
14	2.21	3.14	1.50	1.93	
15	3.57	3.93	2.00	2.43	
16	2.21	2.93	1.36	1.79	
17	2.43	3.36	1.57	2.00	*R
18	2.36	2.14	1.36	1.43	OMIT
19	2.21	2.29	1.29	1.57	OMIT
20	2.71	2.79	1.79	2.00	
21	3.29	3.50	1.64	2.21	*F
22	2.43	2.43	1.64	1.79	OMIT
23	2.71	2.50	1.50	1.64	
24	3.07	3.21	1.64	2.07	
25	2.64	2.93	1.64	1.86	
26	2.57	2.86	1.57	1.79	
27	3.00	2.43	1.43	1.64	
28	2.50	2.29	1.36	1.43	OMIT
29	2.71	2.50	1.43	1.57	
30	3.29	3.29	1.57	2.14	*F
31	2.57	2.21	1.57	1.50	OMIT
32	2.79	2.57	1.36	1.79	
33	2.57	2.53	1.29	1.46	
34	2.36	2.77	1.21	1.77	*F
35	3.36	3.29	1.79	2.14	
36	2.64	2.79	1.29	1.93	*F
37	2.64	2.71	1.50	1.71	
38	1.93	1.69	1.14	1.15	OMIT
39	2.14	2.38	1.29	1.46	OMIT
40	2.86	2.71	1.43	1.71	
41	2.64	2.71	1.29	1.79	
42	2.43	2.50	1.21	1.64	*F
43	3.64	3.29	1.71	2.29	*F
44	3.29	3.00	1.57	2.00	

TABLE 16

INSTRUMENTATION
(Industrial Electronics)

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
1	2.47	3.14	1.73	2.00	
2	3.07	3.57	2.07	2.29	
3	3.00	3.00	2.00	2.00	
4	3.20	3.86	2.13	2.43	
5	2.73	2.71	1.87	1.86	
6	2.47	2.29	1.80	1.71	
7	2.27	3.57	1.67	2.14	*R
8	2.60	3.57	1.87	2.14	
9	2.47	3.43	1.73	2.14	
10	2.07	2.71	1.40	1.71	
11	3.00	3.14	2.00	2.00	
12	3.20	3.29	2.07	2.00	
13	2.27	2.57	1.47	1.57	
14	3.53	4.14	2.20	2.57	
15	2.87	3.71	1.86	2.14	
16	2.53	3.00	1.73	1.86	
17	2.13	1.86	1.47	1.57	OMIT
18	2.73	3.29	1.80	1.86	
19	2.07	2.33	1.40	1.33	OMIT
20	3.47	3.43	2.20	2.14	
21	2.67	3.29	1.73	2.00	
22	2.20	2.43	1.47	1.43	OMIT
23	2.13	2.43	1.40	1.57	OMIT
24	2.47	2.43	1.53	1.71	OMIT
25	1.87	2.28	1.13	1.57	*F OMIT
26	2.00	2.71	1.20	1.71	*F
27	1.93	2.43	1.20	1.71	OMIT
28	2.26	2.71	1.40	1.71	
29	2.40	2.86	1.53	1.71	
30	2.40	2.57	1.53	1.57	
31	2.13	2.57	1.29	1.57	
32	1.67	2.29	1.14	1.57	OMIT
33	1.80	2.43	1.14	1.71	*F OMIT
34	3.80	4.00	2.33	2.43	
35	3.27	4.00	2.00	2.43	
36	2.53	2.71	1.40	1.71	
37	2.60	2.86	1.47	1.86	
38	2.20	2.71	1.27	1.86	
39	2.26	2.86	1.27	1.86	
40	2.00	2.00	1.20	1.43	OMIT
41	2.13	2.57	1.33	1.57	
42	2.00	2.57	1.26	1.57	
43	2.27	2.43	1.40	1.57	OMIT
44	3.27	3.29	2.06	2.00	
45	3.60	3.29	2.13	2.00	
46	3.40	2.43	2.00	1.71	
47	2.27	1.43	1.47	1.14	OMIT
48	2.20	1.57	1.40	1.29	OMIT

TABLE 16

INSTRUMENTATION
(Industrial Electronics)

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY (Continued)

MATH TASK	RATING - MEAN			FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER		EMPLOYEE	EMPLOYER	
49	2.07	2.29		1.13	1.57	*F OMIT
50	1.60	1.14		1.07	1.14	OMIT

TABLE 17 **CARPENTERS**

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
1	3.88	3.80	2.56	2.50	
2	4.88	4.60	3.00	3.00	
3	4.50	4.40	2.75	2.80	
4	4.44	4.20	2.81	2.50	
5	4.50	3.80	2.69	2.40	
6	3.50	3.60	2.19	2.20	
7	3.56	3.60	2.12	2.20	
8	3.62	3.60	2.25	2.00	
9	3.31	3.70	2.07	2.20	
10	3.69	3.70	2.31	2.30	
11	3.50	3.70	2.12	2.30	
12	4.44	4.20	2.69	2.60	
13	3.81	3.50	2.38	2.40	
14	2.25	3.00	1.50	2.30	*F
15	2.19	3.50	1.31	2.33	*RF
16	2.44	3.90	1.50	2.20	*RF
17	3.06	3.30	1.94	2.00	
18	2.38	2.90	1.57	1.70	
19	4.00	4.10	2.38	2.50	
20	3.62	3.60	2.06	2.40	
21	3.38	3.30	1.88	2.10	
22	3.12	3.10	1.75	2.10	
23	2.75	2.60	1.75	2.00	
24	3.12	3.30	1.88	2.10	
25	3.88	4.10	2.44	2.60	
26	4.19	4.20	2.62	2.70	
27	2.06	2.40	1.25	1.70	OMIT
28	3.31	3.40	2.00	2.20	
29	3.69	4.10	2.19	2.60	
30	4.12	4.20	2.56	2.60	
31	3.69	4.20	2.12	2.70	*F
32	3.81	4.30	2.31	2.70	
33	3.12	3.10	1.94	2.00	
34	4.62	4.40	2.62	2.70	
35	4.25	4.40	2.38	2.70	
36	3.94	4.10	2.19	2.40	
37	4.00	4.00	2.06	2.70	*F
38	3.00	3.60	1.81	2.20	
39	3.06	3.40	1.94	2.00	
40	3.38	3.60	1.88	2.00	
41	2.69	3.40	1.69	2.30	*F
42	4.12	4.40	2.62	2.60	
43	4.31	4.10	2.44	2.60	
44	4.50	4.40	2.50	2.70	
45	4.31	4.40	2.25	2.50	
46	4.38	4.40	2.25	2.60	
47	3.81	3.90	2.19	2.30	
48	2.56	3.10	1.50	2.20	*F

TABLE 17 **CARPENTERS**

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY (Continued)

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
49	3.00	3.20	1.62	2.20	*F
50	3.27	3.70	1.87	2.20	
51	2.53	2.80	1.60	1.70	
52	2.47	2.40	1.47	1.70	OMIT
53	2.67	2.90	1.73	1.90	
54	3.67	3.80	2.27	2.30	
55	3.31	3.50	1.94	2.20	
56	3.44	3.70	2.00	2.50	
57	3.06	3.20	1.69	2.20	
58	3.88	4.30	1.94	2.70	*F
59	2.12	1.90	1.25	1.40	OMIT
60	2.12	2.20	1.31	1.60	OMIT
61	2.12	1.90	1.19	1.30	OMIT
62	2.07	1.90	1.13	1.30	OMIT
63	2.19	2.10	1.31	1.40	OMIT
64	1.67	1.90	1.27	1.20	OMIT
65	3.44	3.90	1.94	1.26	*F

TABLE 18

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
1	4.15	4.68	2.67	2.89	*RF
2	4.15	4.50	2.67	2.80	
3	3.76	4.27	2.46	2.66	*R
4	3.52	3.77	2.35	2.30	
5	3.11	3.38	2.04	2.16	
6	2.76	2.84	1.91	1.91	
7	4.07	3.80	2.41	2.50	
8	4.09	4.20	2.57	2.59	
9	2.89	3.00	1.95	2.09	
10	3.52	3.53	2.23	2.29	
11	3.20	3.15	1.98	2.02	
12	3.20	3.33	2.05	2.24	
13	3.53	3.52	2.14	2.19	
14	3.05	2.93	2.00	1.96	
15	3.09	3.26	2.00	2.19	
16	1.66	1.64	1.23	1.35	OMIT
17	2.70	3.07	1.89	2.05	
18	2.39	2.55	1.66	1.80	
19	2.53	2.78	1.77	1.89	
20	2.89	3.02	1.84	2.04	
21	2.16	2.69	1.45	1.89	*RF
22	2.02	2.31	1.43	1.66	OMIT
23	3.93	3.63	2.43	2.39	
24	2.00	3.30	1.48	1.61	
25	3.64	3.73	2.43	2.47	
26	3.00	3.07	1.95	2.06	
27	1.98	2.11	1.45	1.56	OMIT
28	4.30	4.45	2.77	2.78	
29	3.28	3.59	1.96	2.29	*F
30	2.02	2.09	1.41	1.55	OMIT
31	2.57	2.30	1.70	1.62	OMIT
32	2.11	2.02	1.43	1.59	OMIT
33	1.91	1.71	1.37	1.32	OMIT
34	2.20	1.77	1.46	1.36	OMIT
35	2.17	2.09	1.50	1.62	OMIT
36	2.24	2.11	1.48	1.60	OMIT
37	2.43	2.41	1.61	1.77	OMIT
38	4.13	4.02	2.50	2.45	
39	2.02	2.25	1.43	1.57	OMIT
40	2.35	2.50	1.57	1.70	
41	3.46	3.34	2.07	2.11	
42	1.89	2.42	1.39	1.73	*RF OMIT
43	2.41	2.68	1.70	1.88	
44	2.26	2.59	1.50	1.82	*F
45	3.35	3.07	2.04	2.04	
46	3.07	2.88	1.87	1.93	
47	1.96	2.16	1.43	1.51	OMIT
48	1.89	1.89	1.39	1.45	

TABLE 18 COMBINED AUTO SERVICE

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY (Continued)

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
49	2.80	3.22	1.80	2.09	*F
50	2.52	2.76	1.68	1.84	
51	4.43	4.36	2.75	2.62	
52	1.98	2.18	1.41	1.48	OMIT
53	1.77	2.00	1.30	1.41	OMIT
54	1.61	1.71	1.18	1.41	OMIT
55	2.43	2.16	1.50	1.52	OMIT
56	2.07	2.07	1.41	1.61	OMIT
57	1.82	2.13	1.30	1.62	*F OMIT
58	1.77	2.03	1.30	1.55	OMIT
59	2.45	2.69	1.70	1.85	
60	3.32	2.98	1.98	1.91	
61	3.05	3.00	1.91	2.02	
62	2.89	2.91	1.84	2.00	
63	3.05	2.84	1.84	2.00	
64	2.84	2.85	1.77	2.02	
65	2.55	2.62	1.59	1.84	
66	2.84	2.36	1.75	1.64	
67	3.23	3.24	2.02	2.16	
68	2.30	2.56	1.43	1.80	*F
69	3.50	3.36	2.16	2.29	
70	3.02	2.25	1.83	1.64	*R
71	2.98	2.36	1.80	1.69	*R
72	2.98	3.21	1.87	2.15	*F
73	3.09	2.55	1.83	1.73	
74	2.65	2.41	1.67	1.65	
75	2.65	2.32	1.57	1.65	

TABLE 19 **COMBINED SALES**

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY

MATH TASK	RATING - MEAN		FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER	EMPLOYEE	EMPLOYER	
1	4.50	4.32	2.83	2.88	
2	2.83	3.12	1.89	2.12	
3	2.72	2.97	1.67	2.06	*F
4	2.06	2.18	1.44	1.62	OMIT
5	3.22	3.35	2.06	2.24	
6	2.78	2.97	1.89	2.03	
7	3.44	2.79	2.28	2.50	
8	2.72	3.18	1.72	2.15	
9	3.17	3.61	2.06	2.33	
10	3.67	4.09	2.28	2.59	
11	3.28	3.36	2.22	2.27	
12	4.39	4.52	2.67	2.85	
13	4.11	4.48	2.50	2.85	
14	3.67	4.30	2.33	2.61	
15	4.00	4.61	2.44	2.85	
16	4.00	4.42	2.28	2.64	
17	3.06	3.79	1.94	2.36	
18	2.94	3.70	1.72	2.39	*F
19	4.22	4.45	2.61	2.73	
20	3.78	4.42	2.28	2.67	
21	3.28	3.67	1.94	2.24	
22	3.67	4.06	2.17	2.55	
23	3.56	4.21	2.17	2.45	
24	3.44	4.09	2.17	2.52	
25	3.11	3.00	1.94	1.91	
26	3.44	3.09	2.22	1.91	
27	2.44	2.70	1.56	1.73	
28	1.94	2.06	1.28	1.41	OMIT
29	2.22	2.00	1.50	1.41	OMIT
30	2.06	2.06	1.28	1.50	OMIT
31	1.61	1.68	1.11	1.29	OMIT
32	1.83	1.71	1.22	1.26	OMIT
33	1.72	1.79	1.22	1.38	OMIT
34	3.22	3.18	2.00	2.15	
35	2.00	2.18	1.28	1.50	OMIT
36	2.56	2.97	1.56	2.03	*F
37	2.61	2.71	1.50	1.85	
38	2.06	2.35	1.33	1.65	OMIT
39	3.00	3.71	1.78	2.24	*F
40	3.94	3.12	2.44	2.03	
41	2.24	2.62	1.53	1.68	
42	2.22	2.26	1.39	1.56	OMIT
43	3.17	3.79	1.83	2.32	*F
44	3.39	4.06	2.06	2.38	
45	3.06	3.82	1.78	2.38	*F
46	3.00	3.88	1.72	2.41	*RF
47	2.83	3.53	1.61	2.32	
48	2.78	3.58	1.61	2.27	*F

TABLE 19 **COMBINED SALES**

RATING AND FREQUENCY MEANS ON MATH TASKS SURVEY (Continued)

MATH TASK	RATING - MEAN			FREQUENCY - MEAN		
	EMPLOYEE	EMPLOYER		EMPLOYEE	EMPLOYER	
49	2.72	3.74		1.61	2.26	*RF
50	2.17	2.97		1.28	1.97	*RF
51	2.06	2.21		1.33	1.59	
52	2.33	3.06		1.44	1.94	*F
53	3.22	3.09		1.89	1.97	
54	2.94	3.00		1.72	1.79	

TABLE 21: EMPLOYEE SATISFACTION WITH OWN MATHEMATICS PERFORMANCE ON THE JOB

In the survey employees were asked to respond to the question: "Are you satisfied with your mathematical performance on the job?" The following table delineates, by program area the employees' responses.

NO.	PROGRAM	RESPONSE	FREQUENCY	PERCENT
1	Account Clerk	Yes	24	100
		No	0	0
2	Accounting	Yes	22	91.7
		No	2	8.3
3	Mechanical Drafting	Yes	8	100
		No	0	0
4	Mechanical Design	Yes	22	88
		No	3	12
5	Machine Tool	Yes	18	100
		No	0	0
6	Auto Mechanics	Yes	10	100
		No	0	0
7	Auto Parts	Yes	6	85.7
		No	1	14.3
8	Auto Body	Yes	10	100
		No	0	0
9	Diesel Mechanics	Yes	14	87.5
		No	2	12.5
10	Welding	Yes	7	77.8
		No	2	22.2
11	Retail Sales	Yes	8	100
		No	0	0

TABLE 21 (Continued)

NO.	PROGRAM	RESPONSE	FREQUENCY	PERCENT
12	Sales Management	Yes	8	80
		No	2	20
13	Electricity (Electrical Power)	Yes	12	92.3
		No	1	7.7
14	Instrumentation (Industrial Electronics)	Yes	14	93.3
		No	1	6.7
15	Wood Technics	Yes	15	93.8
		No	1	6.2
16	Combined Auto Service	Yes	40	93
		No	3	7
17	Combined Sales	Yes	16	88.9
		No	2	11.1

TABLE 22: EMPLOYEE SATISFACTION WITH MATHEMATICS PREPARATION AT VTAE SCHOOL

In the survey employees were asked to respond to the question: "Are you satisfied with the mathematical preparation you received at the technical institute you attended?" The following table delineates, by program area, the employees' response.

NO.	PROGRAM	RESPONSE	FREQUENCY	PERCENT
1	Account Clerk	Yes	20	95
		No	1	5
2	Accounting	Yes	21	95.5
		No	1	4.5
3	Mechanical Drafting	Yes	8	100
		No	0	0
4	Mechanical Design	Yes	19	79.2
		No	5	20.8
5	Machine Tool	Yes	17	94.4
		No	1	5.6
6	Auto Mechanics	Yes	9	90
		No	1	10
7	Auto Parts	Yes	6	85.7
		No	1	14.3
8	Auto Body	Yes	10	100
		No	0	0
9	Diesel Mechanics	Yes	11	68.8
		No	5	31.3
10	Welding	Yes	7	77.8
		No	2	22.2
11	Retail Sales	Yes	7	87.5
		No	1	12.5

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TABLE 22 (Continued)

NO.	PROGRAM	RESPONSE	FREQUENCY	PERCENT
12	Sales Management	Yes	7	77.8
		No	2	22.2
13	Electricity (Electrical Power)	Yes	11	91.7
		No	1	8.3
14	Instrumentation (Industrial Electronics)	Yes	14	93.3
		No	1	6.7
15	Wood Technics	Yes	12	75
		No	4	25
16	Combined Auto Service	Yes	36	83.7
		No	7	16.3
17	Combined Sales	Yes	14	82.4
		No	3	17.6

CHAPTER IV CONCLUSIONS

After examining the results of this study, the following conclusions could be made:

(1) The employer and employee expectations and satisfaction with the mathematics competencies essential to perform in fifteen occupations were identified.

(2) An improved model and set of mathematics competencies which can be used to develop VTAE mathematics curriculum for any occupation was developed.

(3) A profile matrix of mathematics competencies v.s. occupations was developed which discriminates those competencies which are common to all occupations and those which are peculiar to specific occupations.

RECOMMENDATIONS

The methods used to achieve the objectives are recommended. This was a pilot study and tentative findings have been established. The interim results need to be tested and verified in an expanded study. The techniques used here should be discussed, reviewed, and modified. A state wide survey should include more than fifteen occupations. The resulting broad data base of employee and employer expectations would have a significant impact on curriculum development to ensure the attainment of the mathematical competencies needed in the world of work.

MASTER LIST OF MATHEMATICS COMPETENCIES

PROGRAM ______________________________

Please review the mathematics competencies listed below and rate each one for your particular program as being essential, nice to know or not needed. Feel free to add any mathematics skills to the list that are needed.

	ARITHMETIC SKILLS	ESSENTIAL	NICE TO KNOW	NOT NEEDED
100	Say, Read, Write Whole Numbers	3	2	1
101	Compare Whole Numbers Which Is Greater (Or Less Than)	3	2	1
102	Add and Subtract Whole Numbers	3	2	1
103	Multiply and Divide Whole Numbers	3	2	1
104	Say, Read, Write Fractions	3	2	1
105	Compare Fractions Which Is Greater (Or Less Than)	3	2	1
106	Add and Subtract Fractions	3	2	1
107	Multiply and Divide Fractions	3	2	1
108	Reduce Fractions to Lowest Terms	3	2	1
109	Say, Read, Write Decimals	3	2	1
110	Compare Decimals Which is Greater (Or Less Than)	3	2	1
111	Convert Fractions to Decimals and Vice Versa	3	2	1
112	Add and Subtract Decimals	3	2	1
113	Multiply and Divide Decimals	3	2	1
114	Add, Subtract, Multiply and Divide Mixed Numbers	3	2	1
115	Round Off Numbers and Decimals	3	2	1
116	Use Precision Properly and Given Two Measurements Determine Which is the Most Precise	3	2	1
117	Use Significant Digits Properly in Calculations	3	2	1
118	Estimate the Results of Arithmetic Operations Before Performing the Operations Using a Calculator or by Hand	3	2	1

		ESSENTIAL	NICE TO KNOW	NOT NEEDED
119	Use a Calculator	3	2	1
120	Find Square Root And Square a Number	3	2	1
121	Define Percentage	3	2	1
122	Convert Fractions to Percents	3	2	1
123	Convert Decimals to Percent	3	2	1
124	Convert Percents to Decimals	3	2	1
125	Convert Percents to Common Fractions	3	2	1
126	Find a Percent of a Number	3	2	1
127	Find a Number When a Percent of it is Known	3	2	1
128	Finding What Percent One Number is of Another	3	2	1

MENSURATION SKILLS

200	Understand Perpendicular and Parallel	3	2	1
201	Understand the Basic Concepts Such as Point, Line, Plane, Parallel, Perpendicular, and Angles	3	2	1
202	Understand Properties of Basic Geometric Figures	3	2	1
203	Construction of Basic Geometric Figures	3	2	1
204	Congruence and Similarity	3	2	1
205	Read a Micrometer	3	2	1
206	Measure Distance, Weight, Time, Capacity and Temperature in Both the Metric and Customary Units	3	2	1
207	Determine Accuracy and Relative Error in Measurements	3	2	1
208	Measure From Scale Drawings	3	2	1
209	Find the Area of a Square	3	2	1
210	Find the Area of a Rectangle	3	2	1

		ESSENTIAL	NICE TO KNOW	NOT NEEDED
211	Find the Area of a Triangle	3	2	1
212	Find the Area of a Parallelogram	3	2	1
213	Find the Area of a Trapezoid	3	2	1
214	Find the Area of a Circle Using $A = \pi r^2$	3	2	1
215	Surface Areas (Cylinder, Box, Sphere)	3	2	1
216	Find the Perimeter of Simple Geometric Figures	3	2	1
217	Find the Circumference of a Circle Using $C = \pi d$	3	2	1
218	Convert English to Metric Units and Vice Versa	3	2	1
219	Solve Problems Using Common English and Metric Units of Measure (Length, Weight, Volume, Temperature, Time)	3	2	1
220	Analyze Dimensions and Convert Units of Measurement	3	2	1
221	Find the Volume of a Cube	3	2	1
222	Find the Volume of a Rectangular Solid	3	2	1
223	Find the Volume of a Cylinder	3	2	1
224	Find the Volume of a Sphere	3	2	1
225	Find the Volume of a Pyramid	3	2	1
226	Find the Volume of a Cone	3	2	1
227	Read A Rule (English and Metric)	3	2	1
228	To Calculate the Scale to Scale Something Up or Scale Something Down	3	2	1
229	Define Degrees, Minutes, and Seconds	3	2	1
230	Measure Angles	3	2	1
231	Measure An Angle Using a Protractor	3	2	1
232	Add and Subtract Angles Using Degrees and Minutes	3	2	1
233	Define Right, Acute, and Obtuse Angles	3	2	1

		ESSENTIAL	NICE TO KNOW	NOT NEEDED
234	To Understand Supplimentary and Complementary Angles	3	2	1
235	To Use A Square For Direct And Indirect Measurement	3	2	1
	ALGEBRAIC SKILLS			
300	Perform Arithmetic Operations With Signed Numbers	3	2	1
301	Express Numbers In Scientific Notation and Vice Versa	3	2	1
302	Perform Computations With Scientific Notation	3	2	1
303	Identify Rational, Irrational, and Complex Numbers	3	2	1
304	Know Cummulative, Associative, and Distributive Properties of Number Systems	3	2	1
305	Use Order of Operations with Parenthesis, Brackets and Braces	3	2	1
306	Solve Ratio Problems	3	2	1
307	To Perform Algebraic Addition, Subtraction, Multiplication, and Division (Simplify)	3	2	1
308	Ratio, Proportion, Variation	3	2	1
309	Solve Direct Proportion Problems	3	2	1
310	Solve a Formula for any Indicated Variable	3	2	1
311	Solve Simple Algebraic Equations with one Unknown	3	2	1
312	Substitute in a Formula	3	2	1
313	Solve Inverse Proportion Problems	3	2	1
314	To Determine the Coordinators of a Point in the Rectangular Coordinate System	3	2	1
315	To Plot Points Using the Rectangular Coordinate System	3	2	1
316	Solve Problems Using Exponents (y^x) & $(\sqrt[x]{y})$	3	2	1
317	Perform Operations Exponents and Radicals ($\sqrt{A} + A^2 = 48$)	3	2	1

		ESSENTIAL	NICE TO KNOW	NOT NEEDED
318	Solve Quadratic Equations ($L^2+3L-7=42$)	3	2	1
319	Solve Albegraic Fractional Equations ($\frac{1}{R_1}+\frac{1}{R_2}=\frac{1}{R_T}$)	3	2	1
320	Factoring Multiples and Special Products	3	2	1
321	Solve Linear Equations in Two Variables (Graphically, Substitution, Addition and Subtraction, Determinents)	3	2	1
322	To Graph a Straight Line in the Rectangular Coordinate System	3	2	1
323	Know Slope Intercept Form of a Straight Line	3	2	1
324	To Graph a Curved Line in the Rectangular Coordinate System	3	2	1
325	Absolute Values (Distance)	3	2	1
326	Use Inequalities	3	2	1
327	Use Functional Notation ($F(x)=x+3$)	3	2	1
328	Solve Three Equations Three Unknowns	3	2	1
329	Evaluate and Perform Operations on Matrices (Two Dimensional Classifications)	3	2	1
330	Use Determinants to Solve Systems of Equations	3	2	1
331	Solve Exponential Equations ($i=1.50e^{-200t}$)	3	2	1
332	Use Common(Log)and Natural (LN) Logarithmic Notation	3	2	1
333	Use Exponential and Logarithmic Functions (e^x)	3	2	1
334	Use the Binomial Theorem	3	2	1
335	To Understand the Equations of the Conic Sections	3	2	1
336	To Graph the Conic Sections	3	2	1
337	Linear Programming	3	2	1
338	Know Strategies of Problem Solving Utilizing Word and Numerical Problems	3	2	1

		ESSENTIAL	NICE TO KNOW	NOT NEEDED
339	Solve Relevant Problems	3	2	1
340	Take Everyday Problems, Translate Them Into Mathematical Expressions, Solve the Mathematics and Interpret the Results in Light of the Initial Situation	3	2	1
	TRIGONOMETRIC SKILLS			
400	Use a Right Triangle	3	2	1
401	Pythagorean Theorem	3	2	1
402	Find the Distance Between Two Points in a Plane	3	2	1
403	To Find the Length of the Unknown Side of a Right Triangle (Using the Pythagorean Theorem)	3	2	1
404	Understanding Radian and Degree Measure	3	2	1
405	To Convert Degrees to Radian Measure and Vice Versa	3	2	1
406	Read a Trigonometric Table to Find the Values of Various Trigonometric Functions Such as SIN 30°, TAN 45°, Etc.	3	2	1
407	Apply the SINE, COSINE and TANGENT Functions to the Solving of Right Triangle Problems	3	2	1
408	Apply the Secant, Cosecant, and Cotangent Functions to the Solving of Right Triangle Problems	3	2	1
409	Solve Using the Law of SINES for the Length of a Side or the Size of an Angle of a Triangle	3	2	1
410	Solve Using the Law of COSINES for the Length of a Side or the Size of an Angle of a Triangle	3	2	1
411	To Solve Oblique Triangles	3	2	1
412	To Define Vectors	3	2	1
413	To Add and Subtract Vectors	3	2	1
414	Perform Vector Algebra	3	2	1
415	To Apply Vectors to Force Problems	3	2	1

		ESSENTIAL	NICE TO KNOW	NOT NEEDED
416	Simplify and Evaluate Expressions Involving Trigonometric Identities	3	2	1
417	Graph the Trigonometric Functions	3	2	1
418	Express Complex Numbers in Algebraic, Polar, and Exponential Forms	3	2	1
419	Perform Operations Using Complex Numbers	3	2	1
420	Use Complex Vectors in Solving Problems	3	2	1
421	Solve Trigonometric Equations	3	2	1
422	Perform Operations with Inverse Trigonometric Functions	3	2	1
423	To Compute RPM and Angular Velocity	3	2	1
424	To Calculate Feet Per Second Given R.P.M.	3	2	1

STATISTICAL SKILLS

501	Define Descriptive and Inferential Statistics	3	2	1
502	Interpret Information Presented on a Frequency Distribution, or on a Graph	3	2	1
503	To Construct a Bar Chart, Graph, Pie Graph or Line Graph	3	2	1
504	To Find the Mean, Mode and Median Measures of Central Tendencies	3	2	1
505	To Calculate Standard Deviation and Variance	3	2	1
506	To Calculate Probability	3	2	1
507	To Determine the Total Ways of Doing Something (Combinations and Permutations)	3	2	1
508	To Calcualte Probabilities from the Normal Curve Percentage Table	3	2	1

		ESSENTIAL	NICE TO KNOW	NOT NEEDED
509	To Use Hypothesis Testing	3	2	1
510	To Use Bayesian Decision Theory	3	2	1
511	To Select A Sample for Statistical Purposes	3	2	1
512	Use Chi-Square	3	2	1
513	Use Correlation Analysis	3	2	1
514	Use Regression Analysis	3	2	1
515	Use Analysis of Variance	3	2	1
516	Time Trend Analysis	3	2	1
517	Use Trend Extension	3	2	1
518	Use Index Numbers	3	2	1
519	To Understand the Normal Distribution	3	2	1
520	To Estimate and Predict Use the Science of Statistics	3	2	1

COMPUTER SKILLS

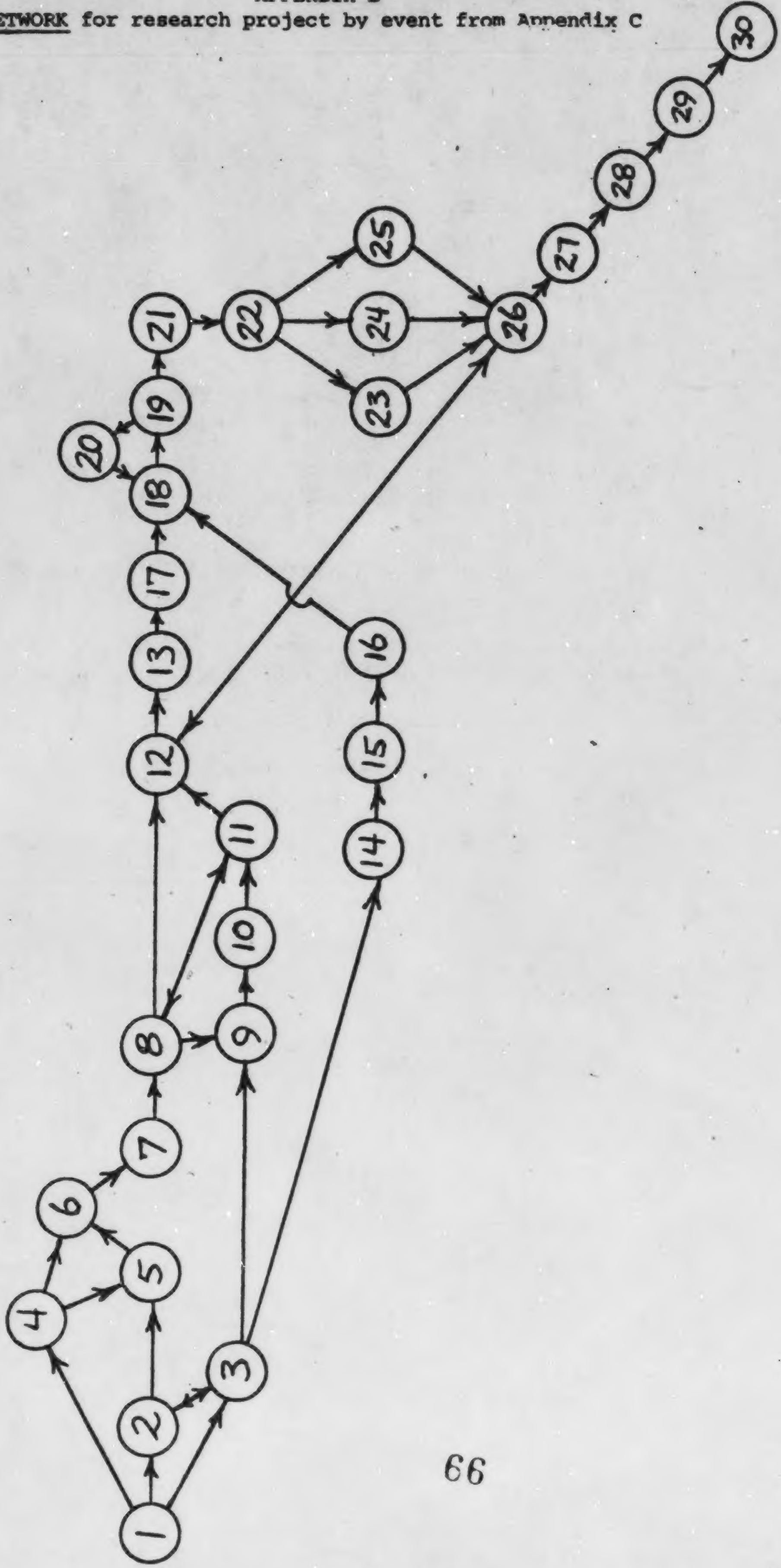
601	Computer Literacy	3	2	1
602	Computer Capabilities	3	2	1
603	Computer as a Tool to Aid in Problem Solving	3	2	1
604	Computer Operations	3	2	1
605	Computer Applications	3	2	1
606	Computer Logic	3	2	1
607	Algorithms	3	2	1
608	Flow Charts	3	2	1
609	Programming Language	3	2	1
610	Program Writing (Getting Information in an out of Computers)	3	2	1

CALCULUS

		ESSENTIAL	NICE TO KNOW	NOT NEEDED
700	Solve problems Which Involve the Instantaneous Rate of Change of one Quantity With Respect to Another (Differentiation)	3	2	1
701	Find Equations of Lines Tangent, and Lines Normal to a Given Curve	3	2	1
702	Describe the Velocity and Acceleration of an Object Moving in a Plane Along a Specified Path Using Vectors (Curvilinear Motion) of a Projectile	3	2	1
703	Use Derivatives to Sketch Curves (Maximum, Minimum and Points of Inflection)	3	2	1
704	Find Maximum or Minimum Value of a Problem from an Applied Situation i.e. Maximum Efficiency of an Engine or Minimum Cost for Production	3	2	1
705	Find the Area Under a Curve by Means of Integration	3	2	1
706	Use Numerical Methods of Integration to Calculate the Area Under a Curve	3	2	1
707	Find Volumes of Geometric Figures Generated by Rotating an Area About an Axis (Cylindrical Shell)	3	2	1
708	Use Integration to Determine the Center of Mass for Areas and Solids of Rotation	3	2	1
709	Find the Moment of Inertia (Resistance to Change in Motion) of a Rotating Object Whose Area is Bounded	3	2	1
710	Find the Radius of Gyration of a Rotating Object Whose Area is Bounded	3	2	1
711	Find the Amount of Work Done by a Variable Force (Stretching A Spring)	3	2	1

APPENDIX B

SUMMARY NETWORK for research project by event from Appendix C



APPENDIX C

ACTIVITIES - TIME LINE

	EVENT IDENTIFICATION	TIME LINE
1.	To start project	Jan. 21, 1980
2.	To select occupations	Feb. 15, 1980
3.	To select districts	Feb. 15, 1980
4.	To review Mathematics Competencies (ERIC, review the literature, state math meeting, etc.)	Feb. 15, 1980
5.	To review Mathematics Compentencies for occupations (ERIC, VTAE, WBVTAE, State Math Meeting, etc.)	Feb. 29, 1980
6.	To compile Mathematics Competencies (Master List)	March 7, 1980
7.	To structure Mathematics Competencies into logical groupings. (Master List)	March 14, 1980
8.	To list Mathematics Competencies by occupation	March 28, 1980
9.	To select occupational instructors or advisory committees to interview	March 28, 1980
10.	To schedule meetings with occupational instructors	April 4, 1980
11.	To articulate and synchronize the Mathematics EXIT Competencies with occupational instructors and advisory committees in an interview/meeting (to validate and refine STEP 8)	April 25, 1980
12.	To develop a table of specifications which matches up list in STEP 7 with list in STEP 8, by item number	May 2, 1980
13.	To develop a survey instrument for each occupation from competency list for that occupation which matches up with the table of specifications for cross referencing.	May 23, 1980
14.	To obtain mailing lists from VTAE Districts	May 2, 1980

15.	To start sampling	May 9, 1980
16.	To select sample	May 23, 1980
17.	To print survey instruments.	May 30, 1980
18.	To mail survey instruments to samples	June 2, 1980
19.	To start data coding, and keypunching	June 20, 1980
20.	To complete follow-up. (Not necessary since criteria in Requirement e was met.)	June 30, 1980
21.	To start tabulation and testing by computer	July 1, 1980
22.	To complete computer analysis	July 11, 1980
23.	To analyze computer print out.	July 18, 1980
24.	To complete interpretation	July 18, 1980
25.	To complete tables.	July 18, 1980
26.	To compile list of Mathematics Competencies which: a. Can be used to develop VTAE Math curriculum for any program b. Are common to all occupations surveyed c. Are peculiar to specific occupations. (To validate and refine STEP 12)	July 23, 1980
27.	To start narrative	July 22, 1980
28.	To complete narrative	July 31, 1980
29.	To print findings	Aug. 8, 1980
30.	To report results (25) copies to VTAE, UW System, and DPI.	Aug. 28, 1980

APPENDIX D

ORGANIZATION, OBJECTIVES AND MAJOR DECISION POINTS

A. Phase I

1. Completion of Mathematics Competencies Master List — March 7
    - a. Personnel
        1. Project Director
        2. Three Mathematics Instructors
    - b. Activities 1, 2, 3, 4, 5, 6, 7
2. Review Mathematics Competencies Master List with occupational instructors. Develop a preliminary occupations Mathematics Competencies List. — March 28
    - a. Personnel
        1. Project Director
        2. Three Mathematics Instructors
        3. Fifteen Occupational Instructors
        4. Fifteen Advisory Committees
    - b. Activities 8, 9
3. Refine the Mathematics Competencies Master List and Occupational Mathematics Competencies List. — April 25
    - a. Personnel
        1. Project Director
        2. Three Mathematics Instructors
        3. State Staff
        4. Other Districts in VTAE System
    - b. Activities 10, 11
4. Finalize Mathematics Competencies Master List and Occupational Mathematics Competencies List — May 2
    - a. Personnel
        1. Project Director
        2. Three Mathematics Instructors
    - b. Activity 12
5. Disseminate copies of both Competencies Lists to state and each VTAE district in state.

B. Phase II

1. Develop unique survey instrument for each of the fifteen Occupations from competency list developed in Phase I. — May 23
    - a. Personnel
        1. Project Director
        2. Three Mathematics Instructors
    - b. Activity 13
2. Complete the piloting of the survey instrument for each of the fifteen occupations. — June 30
    - a. Personnel
        1. Project Director

  - b. Activities 14, 15, 16, 17, 18, 19, 20

3. Complete computer analysis of survey instrument. July 18
   - a. Personnel
     - 1. Project Director
   - b. Activities 21, 22, 23
4. Analyze computer print out and make final report. Aug. 28
   - a. Personnel
     - 1. Project Director
   - b. Activities 24, 25, 26, 27, 28, 29, 30

APPENDIX E

SURVEY INSTRUMENTS AND COVER LETTER

June, 1980

May we please request your invaluable assistance?

You have been selected to participate in a state wide study to determine the mathematical skills an entry-level employee needs to perform successfully on the job.

Employees (graduates of technical institutes) and employers are being surveyed. Your responses on the attached questionnaire will help technical institutes develop mathematics courses. The information you provide will be confidential. Only a summary of all responses will be available.

Please return the questionnaire in the postage paid envelope by June 27, 1980. I appreciate your help in assuring the relevance of our course content.

Sincerely yours,

Bruce W. Koopika

Bruce W. Koopika
Project Director

BWK:njn

Enclosures

0	0	1			

QUESTIONNAIRE

The purpose of this questionnaire is to determine how essential the following mathematical tasks are in the performance of ACCOUNT CLERK work.

PART ONE

DIRECTIONS: Please fill in the blank, or circle the number that best indicates your response to the statement.

1. What is your present status?

   a. Employee

   b. Employer/Supervisor

2. What is your job description or job title?

   ____

- -

OPTIONAL INFORMATION:

Name ______________________________

Company ______________________________

Address ______________________________

____

If you would like a summary of the results, please check the box: ☐

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PART TWO

DIRECTIONS:

(1) For Rating Scale

Circle the number on the "Rating Scale" that best indicates your response on how essential the task is in the performance of ACCOUNT CLERK work. Use the following responses:

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

(2) For Frequency Scale

Circle the number on the "Frequency of Use Scale" that best indicates your response on how often the task is used. Use the following responses:

1 = Never
2 = Occasionally
3 = Regularly

	RATING	FREQUENCY
EXAMPLE: Compute the area of a rectangle	1 2 3 4 5	1 2 3

The following is the list of mathematical tasks.

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
1. Add and subtract fractions	1 2 3 4 5	1 2 3
2. Multiply and divide fractions	1 2 3 4 5	1 2 3
3. Add and subtract decimals	1 2 3 4 5	1 2 3
4. Multiply and divide decimals	1 2 3 4 5	1 2 3
5. Convert fractions to decimals and vice versa	1 2 3 4 5	1 2 3
6. Use a calculator	1 2 3 4 5	1 2 3
7. Use estimation as a technique to determine the reasonableness of a result to a calculation	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
9.	Convert percents to decimals and vice versa	1 2 3 4 5	1 2 3
10.	Convert fractions to percents and vice versa	1 2 3 4 5	1 2 3
11.	Solve percentage problems: - Percent of a number - What percent one number is of another - A number when a percent of it is known	1 2 3 4 5	1 2 3
12.	Use ratios to compare quantities	1 2 3 4 5	1 2 3
13.	Construct and interpret graphs which depict changing conditions in business	1 2 3 4 5	1 2 3
14.	Compute pay and complete payroll records	1 2 3 4 5	1 2 3
15.	Calculate simple and compound interest	1 2 3 4 5	1 2 3
16.	Calculate trade and cash discounts	1 2 3 4 5	1 2 3
17.	Calculate a job cost	1 2 3 4 5	1 2 3
18.	Prepare invoices	1 2 3 4 5	1 2 3
19.	Calculate payroll deductions	1 2 3 4 5	1 2 3
20.	Calculate cost of goods sold	1 2 3 4 5	1 2 3
21.	Calculate selling price	1 2 3 4 5	1 2 3
22.	Fill out sales slips	1 2 3 4 5	1 2 3
23.	Calculate net sales	1 2 3 4 5	1 2 3
24.	Calculate depreciation	1 2 3 4 5	1 2 3
25.	Calculate sales tax	1 2 3 4 5	1 2 3
26.	Calculate reduced selling prices given percent of markdown	1 2 3 4 5	1 2 3
27.	Calculate areas	1 2 3 4 5	1 2 3
28.	Calculate depreciation	1 2 3 4 5	1 2 3

RATING SCALE	FREQUENCY SCALE
1 = Not Important	1 = Never
2 = Slightly Important	2 = Occasionally
3 = Important	3 = Regularly
4 = Very Important	
5 = Essential	

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
29. Estimate inventory	1 2 3 4 5	1 2 3
30. Understand cash flow, revenues, and expenses	1 2 3 4 5	1 2 3
31. Calculate property taxes	1 2 3 4 5	1 2 3
32. Compute credit for partial payments on invoices that involve cash discounts	1 2 3 4 5	1 2 3
33. Determine financial statement ratios	1 2 3 4 5	1 2 3
34. Compute measures of central tendencies (average, mode, or median)	1 2 3 4 5	1 2 3
35. Use computer terminals for data entry, and data output	1 2 3 4 5	1 2 3
36. Understand computer capabilities, and applications for problem solving	1 2 3 4 5	1 2 3

37. If you are an employer/supervisor, are you satisfied with the mathematical performance of your employees (technical institute graduates)?

1. Yes   2. No

38. If you are an employee, are you satisfied with your mathematical performance on the job?

1. Yes   2. No

39. If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

1. Yes   2. No

40. Please include here any additional mathematics tasks that you believe are needed.

0	0	1			

41. Please include here any further general comments you may have.

If you have any questions, write to me or call (414)497-3000.

Please return the questionnaire in the postage paid envelope. Thank you.

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0	0	2			

QUESTIONNAIRE

The purpose of this questionnaire is to determine how essential the following mathematical tasks are in the performance of ACCOUNTING work.

PART ONE

DIRECTIONS: Please fill in the blank, or circle the number that best indicates your response to the statement.

1. What is your present status?

   a. Employee

   b. Employer/Supervisor

2. What is your job description or job title?

   ____

OPTIONAL INFORMATION:

Name ______________________________

Company ______________________________

Address ______________________________

____

If you would like a summary of the results, please check the box: ☐

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PART TWO

DIRECTIONS:

(1) For Rating Scale

Circle the number on the "Rating Scale" that best indicates your response on how essential the task is in the performance of ACCOUNTING work. Use the following responses:

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

(2) For Frequency Scale

Circle the number on the "Frequency of Use Scale" that best indicates your response on how often the task is used. Use the following responses:

1 = Never
2 = Occasionally
3 = Regularly

	RATING	FREQUENCY
EXAMPLE: Compute the area of a rectangle	1 2 3 4 5	1 2 3

The following is the list of mathematical tasks.

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
1.	Add and subtract fractions	1 2 3 4 5	1 2 3
2.	Multiply and divide fractions	1 2 3 4 5	1 2 3
3.	Convert fractions to decimals and vice versa	1 2 3 4 5	1 2 3
4.	Add and subtract decimals	1 2 3 4 5	1 2 3
5.	Multiply and divide decimals	1 2 3 4 5	1 2 3
6.	Use a calculator with arithmetic operations, and business functions (business analysts)	1 2 3 4 5	1 2 3
7.	Make calculations using formulas with grouping symbols such as parentheses to indicate the order in which operations are to be performed	1 2 3 4 5	1 2 3

RATING SCALE

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2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
8.	Perform the numeric operation of raising a number to a power (y^x)	1 2 3 4 5	1 2 3
9.	Perform the numeric operation of extracting the root of a numer ($\sqrt[x]{y}$)	1 2 3 4 5	1 2 3
10.	Use estimation as a technique to determine the reasonableness of a result to a calculation	1 2 3 4 5	1 2 3
11.	Understand the meaning and use of percent	1 2 3 4 5	1 2 3
12.	Convert percents to decimals or vice versa	1 2 3 4 5	1 2 3
13.	Convert percents to fractions or vice versa	1 2 3 4 5	1 2 3
14.	Solve percentage problems: -Percent of a number -What percent one number is of another -A number when a percent of it is known	1 2 3 4 5	1 2 3
15.	Use ratios to compare quantities	1 2 3 4 5	1 2 3
16.	Construct and interpret graphs which depict changing conditions in business	1 2 3 4 5	1 2 3
17.	Determine areas	1 2 3 4 5	1 2 3
18.	Determine volumes	1 2 3 4 5	1 2 3
19.	Find perimeters	1 2 3 4 5	1 2 3
20.	Identify and solve for an unknown in a formula by substituting numbers for letters	1 2 3 4 5	1 2 3
21.	Rearrange a formula to solve for a specified quantity	1 2 3 4 5	1 2 3
22.	Use problem solving strategies	1 2 3 4 5	1 2 3
23.	Calculate payroll for various time periods	1 2 3 4 5	1 2 3
24.	Calculate simple and compound interest	1 2 3 4 5	1 2 3

RATING SCALE	FREQUENCY SCALE
1 = Not Important	1 = Never
2 = Slightly Important	2 = Occasionally
3 = Important	3 = Regularly
4 = Very Important	
5 = Essential	

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
25.	Determine true annual interest	1 2 3 4 5	1 2 3
26.	Determine trade and cash discounts	1 2 3 4 5	1 2 3
27.	Determine markup on cost, or selling price	1 2 3 4 5	1 2 3
28.	Calculate inventory, reorder point	1 2 3 4 5	1 2 3
29.	Calculate credit for partial payments on invoices that involve cash discounts	1 2 3 4 5	1 2 3
30.	Estimate a job cost (material, man hours, overhead, etc.)	1 2 3 4 5	1 2 3
31.	Prepare invoices including discounts and sales tax calculations	1 2 3 4 5	1 2 3
32.	Calculate payroll deductions	1 2 3 4 5	1 2 3
33.	Calculate depreciation by straight line, sum of the years, and declining balance	1 2 3 4 5	1 2 3
34.	Calculate profits	1 2 3 4 5	1 2 3
35.	Calculate cost of goods sold	1 2 3 4 5	1 2 3
36.	Determine inventory cost by LIFO, FIFO, weighted average	1 2 3 4 5	1 2 3
37.	Calculate cost and selling price	1 2 3 4 5	1 2 3
38.	Determine commissions	1 2 3 4 5	1 2 3
39.	Calculate present values	1 2 3 4 5	1 2 3
40.	Determine annuities	1 2 3 4 5	1 2 3
41.	Determine financial statement ratios	1 2 3 4 5	1 2 3
42.	Determine sinking funds	1 2 3 4 5	1 2 3
43.	Calculate amortization	1 2 3 4 5	1 2 3
44.	Work with, or prepare a stock plan	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
45.	Compute measures of central tendencies (average, mode, or median)	1 2 3 4 5	1 2 3
46.	Calculate standard deviation and variance	1 2 3 4 5	1 2 3
47.	Calculate probabilities	1 2 3 4 5	1 2 3
48.	Select a sample for statistical purposes	1 2 3 4 5	1 2 3
49.	Correlate relationships such as money spent on advertising vs. total yearly sales	1 2 3 4 5	1 2 3
50.	Use regression analysis to forecast such things as profit, sales, growth etc	1 2 3 4 5	1 2 3
51.	Use computer terminals for data entry, and data output	1 2 3 4 5	1 2 3
52.	Understand computer capabilities, and applications for problem solving	1 2 3 4 5	1 2 3
53.	Use flow charts to graphically represent the analysis of a solution to a problem	1 2 3 4 5	1 2 3

54. If you are an employer/supervisor, are your satisfied with the mathematical performance of your employees (technical institute graduates)?

1. Yes 2. No

55. If you are an employee are you satisfied with your mathematical performance on the job?

1. Yes 2. No

56. If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

1. Yes 2. No

0	0	2			

57. Please include here any additional mathematics tasks that you believe are needed.

58. Please include here any further general comments you may have.

If you have any questions, write to me or call (414)497-3000.

Please return the questionnaire in the postage paid envelope. Thank you.

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QUESTIONNAIRE

The purpose of this questionnaire is to determine how essential the following mathematical tasks are in the performance of MECHANICAL DRAFTING work.

PART ONE

DIRECTIONS: Please fill in the blank, or circle the number that best indicates your response to the statement.

1. What is your present status?
    a. Employee
    b. Employer/Supervisor
2. What is your job description or job title?

    ____

OPTIONAL INFORMATION:

Name ________________________________

Company ________________________________

Address ________________________________

____

If you would like a summary of the results, please check the box: ☐

PART TWO

DIRECTIONS:

(1) For Rating Scale

Circle the number on the "Rating Scale" that best indicates your response on how essential the task is in the performance of MECHANICAL DRAFTING work. Use the following responses:

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

(2) For Frequency Scale

Circle the number on the "Frequency of Use Scale" that best indicates your response on how often the task is used. Use the following responses:

1 = Never
2 = Occasionally
3 = Regularly

	RATING	FREQUENCY
EXAMPLE: Compute the area of a rectangle	1 2 3 4 5	1 2 3

The following is the list of mathematical tasks.

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
1. Add and subtract fractions	1 2 3 4 5	1 2 3
2. Multiply and divide fractions	1 2 3 4 5	1 2 3
3. Add and subtract decimals	1 2 3 4 5	1 2 3
4. Multiply and divide decimals	1 2 3 4 5	1 2 3
5. Use different degrees of decimal precision for representing a measurement	1 2 3 4 5	1 2 3
6. Use tables of decimal equivalents	1 2 3 4 5	1 2 3
7. Make decimal measurements to a specific level of accuracy	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
8.	Round a measurement to a given place value	1 2 3 4 5	1 2 3
9.	Convert a measurement given in fractional form to decimal form and vice versa	1 2 3 4 5	1 2 3
10.	Use a calculator	1 2 3 4 5	1 2 3
11.	Make calculations to significant figures to yield results that match given data in precision	1 2 3 4 5	1 2 3
12.	Make calculations using formulas with grouping symbols such as parentheses,to indicate the order in which operations are to be performed	1 2 3 4 5	1 2 3
13.	Perform the numeric operation of raising a number to a power $\{y^x\}$	1 2 3 4 5	1 2 3
14.	Perform the numeric operation of extracting the root of a number $\{\sqrt[x]{y}\}$	1 2 3 4 5	1 2 3
15.	Use estimation as a technique to determine the reasonableness of a result to a calculation	1 2 3 4 5	1 2 3
16.	Understand the meaning and use of percent	1 2 3 4 5	1 2 3
17.	Determine areas	1 2 3 4 5	1 2 3
18.	Determine volumes	1 2 3 4 5	1 2 3
19.	Determine surface areas	1 2 3 4 5	1 2 3
20.	Scale drawing dimensions up or down	1 2 3 4 5	1 2 3
21.	Identify formulas in handbooks to solve for unknowns from given data	1 2 3 4 5	1 2 3
22.	Evaluate formulas by substituting numbers for letters	1 2 3 4 5	1 2 3
23.	Rearrange a formula to solve for a specific quantity	1 2 3 4 5	1 2 3
24.	Rearrange and evaluate two or more formulas for a specific quantity	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES RATING	 FREQUENCY
25.	Use problem solving strateges	1 2 3 4 5	1 2 3
26.	Work with ratio and proportional relationships	1 2 3 4 5	1 2 3
27.	Work with direct and inverse variations	1 2 3 4 5	1 2 3
28.	Locate and plot points in a rectangular coordinate system	1 2 3 4 5	1 2 3
29.	Construct a graph	1 2 3 4 5	1 2 3
30.	Apply absolute and incremental dimensioning work with tolerances and limits to compute maximum and minimum dimensions	1 2 3 4 5	1 2 3
31.	Program dimensions from a drawing using a point-to-point control system	1 2 3 4 5	1 2 3
32.	Use formulas that involve common (log) or natural (Ln) logarithms	1 2 3 4 5	1 2 3
33.	Identify different types of angles	1 2 3 4 5	1 2 3
34.	Determine unknown angles using the principles of opposite, parallel, perpendicular, complement, and supplement	1 2 3 4 5	1 2 3
35.	Add, subtract, multiply, or divide angle measures	1 2 3 4 5	1 2 3
36.	Convert drawing dimensions of unknown lengths into algebraic expressions	1 2 3 4 5	1 2 3
37.	Work with angles and sides of isosceles, or equilateral triangles	1 2 3 4 5	1 2 3
38.	Solve for the unknown length of a side of a right triangle using the pythagorean theorem	1 2 3 4 5	1 2 3
39.	Solve for unknown lengths, or angles of right triangles using trigometric functions	1 2 3 4 5	1 2 3
40.	Solve for unknown lengths, or angles of oblique triangles using the Law of SINES, or the Law of COSINES	1 2 3 4 5	1 2 3

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RATING SCALE

1 = Not Important
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4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
41. Determine angular velocity	1 2 3 4 5	1 2 3
42. Use vectors to represent loads	1 2 3 4 5	1 2 3
43. Solve for unknown loads using vector quantities	1 2 3 4 5	1 2 3
44. Use the properties of SINE waves (amplitude, period, or lead or lag)	1 2 3 4 5	1 2 3
45. Understand computer capabilities, and applications for design, and problem solving	1 2 3 4 5	1 2 3
46. Work with three dimensional graphics	1 2 3 4 5	1 2 3

47. If you are an employer/supervisor, are you satisfied with the mathematical performance of your employees (technical institute graduates)?

1. Yes 2. No

48. If you are an employee are you satisfied with your mathematical performance on the job?

1. Yes 2. No

49. If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

1. Yes 2. No

50. Please include here any additional mathematics tasks that you believe are needed:

51. Please include here any further general comments you may have:

If you have any questions, write to me or call (414)497-3000.
Please return the questionnaire in the postage paid envelope. Thank you.

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QUESTIONNAIRE

The purpose of this questionnaire is to determine how essential the following mathematical tasks are in the performance of MECHANICAL DESIGN work.

PART ONE

DIRECTIONS: Please fill in the blank, or circle the number that best indicates your response to the statement.

1. What is your present status?
   a. Employee
   b. Employer/Supervisor
2. What is your job description or job title?

   ____

- -

OPTIONAL INFORMATION:

Name ______________________________

Company ______________________________

Address ______________________________

____

If you would like a summary of the results, please check the box: ☐

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PART TWO

DIRECTIONS:

(1) For Rating Scale

Circle the number on the "Rating Scale" that best indicates your response on how essential the task is in the performance of MECHANICAL DESIGN work. Use the following responses:

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

(2) For Frequency Scale

Circle the number on the "Frequency of Use Scale" that best indicates your response on how often the task is used. Use the following responses:

1 = Never
2 = Occasionally
3 = Regularly

	RATING	FREQUENCY
EXAMPLE: Compute the area of a rectangle	1 2 3 4 5	1 2 3

The following is the list of mathematical tasks.

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
1. Use a calculator with arithmetic operations, and trigonometric functions	1 2 3 4 5	1 2 3
2. Make calculations to significant figures to yield results that match given data in precision	1 2 3 4 5	1 2 3
3. Make calculations using formulas with grouping symbols, such as parentheses (), brackets[], and braces {}, to indicate the order in which operations are to be performed	1 2 3 4 5	1 2 3
4. Perform the numeric operation of raising a number to a power [y^x]	1 2 3 4 5	1 2 3
5. Perform the numeric operation of extracting the root of a number [$\sqrt[x]{y}$]	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
6. Perform numeric computations on quantities represented by scientific notation	1 2 3 4 5	1 2 3
7. Use estimation as a technique to determine the reasonableness of a result to a calculation	1 2 3 4 5	1 2 3
8. Perform arithmetic operations on signed numbers	1 2 3 4 5	1 2 3
9. Translate word statements into algebraic expressions	1 2 3 4 5	1 2 3
10. Rearrange a formula to solve for a specific quantity	1 2 3 4 5	1 2 3
11. Identify formulas in handbooks to solve for unknowns from given data	1 2 3 4 5	1 2 3
12. Rearrange and evaluate two or more formulas for a specific quantity	1 2 3 4 5	1 2 3
13. Use problem solving strategies	1 2 3 4 5	1 2 3
14. Work with ratio and proportional relationships	1 2 3 4 5	1 2 3
15. Work with direct and inverse variations	1 2 3 4 5	1 2 3
16. Solve formulas of the form: $I=\pi(r_1^2-r_2^2)$ for r_1	1 2 3 4 5	1 2 3
17. Solve formulas of the form: $R=L-\frac{1}{wc}$ for c	1 2 3 4 5	1 2 3
18. Locate and plot points in a rectangular coordinate system	1 2 3 4 5	1 2 3
19. Construct a graph	1 2 3 4 5	1 2 3
20. Apply absolute and incremental dimensioning	1 2 3 4 5	1 2 3
21. Program dimensions from a drawing using a point-to-point control system	1 2 3 4 5	1 2 3
22. Use formulas that involve common (Log) or natural (LN) logarithms	1 2 3 4 5	1 2 3
23. Identify different types of angles	1 2 3 4 5	1 2 3
24. Determine unknown angles using the principles of opposite, parallel, perpendicular, complement, and supplement	1 2 3 4 5	1 2 3

RATING SCALE

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4 = Very Important
5 = Essential

FREQUENCY SCALE

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3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
25.	Perform arithmetic operations on angle measures	1 2 3 4 5	1 2 3
26.	Work with properties of congruent, or similar figures	1 2 3 4 5	1 2 3
27.	Determine areas	1 2 3 4 5	1 2 3
28.	Determine volumes	1 2 3 4 5	1 2 3
29.	Determine surface areas	1 2 3 4 5	1 2 3
30.	Find perimeters	1 2 3 4 5	1 2 3
31.	Use geometric properties of chords, arcs, central angles, and tangents	1 2 3 4 5	1 2 3
32.	Angles and sides of isosceles, or equilateral triangles	1 2 3 4 5	1 2 3
33.	Solve for the unknown length of a side of a right triangle using the pythagorean theorem	1 2 3 4 5	1 2 3
34.	Solve for unknown lengchs, or angles in right triangles using trigometric functions	1 2 3 4 5	1 2 3
35.	Solve for unknown lengths, or angles of oblique triangles using the Law of SINES, or the Law of COSINES	1 2 3 4 5	1 2 3
36.	Determine angular velocity	1 2 3 4 5	1 2 3
37.	Use vectors to represent loads	1 2 3 4 5	1 2 3
38.	Solve for unknown loads using vector quantities	1 2 3 4 5	1 2 3
39.	Solve trigonometric equations	1 2 3 4 5	1 2 3
40.	Use the properties of SINE waves (amplitude, period, or lead or lag)	1 2 3 4 5	1 2 3
41.	Use flowcharts to graphically represent the analysis of a solution to a problem	1 2 3 4 5	1 2 3
42.	Understand computer capabilities and applications for design, and problem solving	1 2 3 4 5	1 2 3

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RATING SCALE

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FREQUENCY SCALE

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	MATHEMATICAL TASKS	RESPONSES RATING	 FREQUENCY
43.	Work with three dimensional graphics	1 2 3 4 5	1 2 3
44.	Find maximum or minimum value, i.e. maximum efficiency of an engine, or minimum cost of production	1 2 3 4 5	1 2 3
45.	Find the volume of a geometric figure generated by rotating an area about an axis (cylindrical shell)	1 2 3 4 5	1 2 3
46.	Use integration to determine the center of mass for areas, and solids of rotation	1 2 3 4 5	1 2 3
47.	Find the amount of work done by a variable force (stretching a spring)	1 2 3 4 5	1 2 3

48. If you are an employer/supervisor, are you satisfied with the mathematical performance of your employees (technical institute graduates)?

1. Yes   2. No

49. If you are an employee, are you satisfied with your mathematical performance on the job?

1. Yes   2. No

50. If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

1. Yes   2. No

51. Please include here any additional mathematics tasks that you believe are needed.

52. Please include here any further general comments you may have.

If you have any questions, write or me or call (414)497-3000.
Please return the questionnaire in the postage paid envelope. Thank you.

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QUESTIONNAIRE

The purpose of this questionnaire is to determine how essential the following mathematical tasks are in the performance of MACHINE TOOL work.

PART ONE

DIRECTIONS: Please fill in the blank, or circle the number that best indicates your response to the statement.

1. What is your present status?
   a. Employee
   b. Employer/Supervisor
2. What is your job description or job title?

   ____

OPTIONAL INFORMATION:

Name ______________________________

Company ______________________________

Address ______________________________

____

If you would like a summary of the results, please check the box: ☐

PART TWO

DIRECTIONS:

(1) For Rating Scale

Circle the number on the "Rating Scale" that best indicates your response on how essential the task is in the performance of MACHINE TOOL work. Use the following responses:

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

(2) For Frequency Scale

Circle the number on the "Frequency of Use Scale" that best indicates your response on how often the task is used. Use the following responses:

1 = Never
2 = Occasionally
3 = Regularly

	RATING	FREQUENCY
EXAMPLE: Compute the area of a rectangle	1 2 3 4 5	1 2 3

The following is the list of mathematical tasks.

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
1. Add and substract fractions	1 2 3 4 5	1 2 3
2. Multiply and divide fractions	1 2 3 4 5	1 2 3
3. Add and substract decimals	1 2 3 4 5	1 2 3
4. Multiply and divide decimals	1 2 3 4 5	1 2 3
5. Use different degrees of decimal precision for representing a measurement	1 2 3 4 5	1 2 3
6. Make decimal measurements to a specific level of accuracy	1 2 3 4 5	1 2 3
7. Round a measurement to a given place value	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
8.	Convert a measurement given in fractional form to decimal form, and vice versa	1 2 3 4 5	1 2 3
9.	Use tables of decimal equivalents	1 2 3 4 5	1 2 3
10.	Use a calculator	1 2 3 4 5	1 2 3
11.	Make calculations to significant figures to yield results that match given data in precision	1 2 3 4 5	1 2 3
12.	Make calculations using formulas with grouping symbols, such as parentheses, to indicate the order in which operations are to be performed	1 2 3 4 5	1 2 3
13.	Perform the numeric operation of raising a number to a power (y^x)	1 2 3 4 5	1 2 3
14.	Perform the numeric operation of extracting the root of a number ($\sqrt[x]{Y}$)	1 2 3 4 5	1 2 3
15.	Use estimation as a technique to determine the reasonableness of a result to a calculation	1 2 3 4 5	1 2 3
16.	Understand the meaning and use of percent	1 2 3 4 5	1 2 3
17.	Convert percents to decimals or vice versa	1 2 3 4 5	1 2 3
18.	Convert percents to fractions or vice versa	1 2 3 4 5	1 2 3
19.	Solve percentage problems: - Percent of a number - A number when a percent of it is known - What percent one number is of another	1 2 3 4 5	1 2 3
20.	Identify different types of angles	1 2 3 4 5	1 2 3
21.	Determine unknown angles in geometric figures using the principles of opposite, parallel, perpendicular, complements, and supplements	1 2 3 4 5	1 2 3
22.	Add, substract, multiply, and divide angles in terms of degrees, minutes, and seconds	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
23.	Convert degrees, minutes, and seconds to decimal degrees, and vice versa	1 2 3 4 5	1 2 3
24.	Measure angles with a simple protractor	1 2 3 4 5	1 2 3
25.	Compute complements and supplements of angles	1 2 3 4 5	1 2 3
26.	Determine areas	1 2 3 4 5	1 2 3
27.	Determine volumes	1 2 3 4 5	1 2 3
28.	Determine surface areas	1 2 3 4 5	1 2 3
29.	Identify parts of a circle	1 2 3 4 5	1 2 3
30.	Solve problems by using geometric principles which involve chords, arcs, central angles, perpendiculars, and tangents	1 2 3 4 5	1 2 3
31.	Lay out and drill equally spaced holes on a circle	1 2 3 4 5	1 2 3
32.	Find the distance around a circle, rectangle, or triangle	1 2 3 4 5	1 2 3
33.	Work with tolerances and limits	1 2 3 4 5	1 2 3
34.	Scale a measurement up or down	1 2 3 4 5	1 2 3
35.	Select gauge block combinations	1 2 3 4 5	1 2 3
36.	Compare signed numbers according to magnitude (size) and direction (+,-) using number scale	1 2 3 4 5	1 2 3
37.	Perform arithmetic operations with signed numbers	1 2 3 4 5	1 2 3
38.	Translate word statements into algebraic expressions	1 2 3 4 5	1 2 3
39.	Convert drawing dimensions of unknown lengths into algebraic expressions	1 2 3 4 5	1 2 3
40.	Evaluate formulas by substituting numbers for letters	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
41.	Perform the basic operations of addition, substraction, multiplication, and division to solve for an unknown quantity in a formula	1 2 3 4 5	1 2 3
42.	Convert graphic information into a formula to solve for an unknown length	1 2 3 4 5	1 2 3
43.	Rearrange a formula to find a designated unknown	1 2 3 4 5	1 2 3
44.	Substitute numbers for letters in a formula, rearrange the formula, and solve for the unknown	1 2 3 4 5	1 2 3
45.	Compare quantities by putting them in ratio form	1 2 3 4 5	1 2 3
46.	Solve for an unknown quantity from an expression of two equal ratios (proportion)	1 2 3 4 5	1 2 3
47.	Solve direct, and inverse proportions	1 2 3 4 5	1 2 3
48.	Solve cutting speed, rpm, and cutting time problems by substitution in given formulas	1 2 3 4 5	1 2 3
49.	Solve production time, and cutting feed problems by rearranging and combining formulas	1 2 3 4 5	1 2 3
50.	Identify the gear formula to use to solve gear problems depending on the unknown, and given data	1 2 3 4 5	1 2 3
51.	Compute gear part dimensions by substituting known values directly into formulas	1 2 3 4 5	1 2 3
52.	Compute gear part dimensions by rearranging, and apply two or more formulas in order to determine an unknown	1 2 3 4 5	1 2 3
53.	Work with angles and sides of isoceles, equilateral, and right triangles	1 2 3 4 5	1 2 3
54.	Find the length of an unknown side of a right triangle	1 2 3 4 5	1 2 3
55.	Convert degree to radian measure and vice versa	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES RATING	 FREQUENCY
56.	Read a trigonometric table to find the values of various trigonometric functions such as Sin 30°, Tan 45°, etc.	1 2 3 4 5	1 2 3
57.	Solve right triangle problems using the sine, cosine or tangent function	1 2 3 4 5	1 2 3
58.	Solve right triangle problems using the secant, cosecant, or cotangent function	1 2 3 4 5	1 2 3
59.	Solve for unknown lengths or angles of oblique triangles using the Law of Sines or the Law of Cosines	1 2 3 4 5	1 2 3
60.	Determine angular velocity	1 2 3 4 5	1 2 3
61.	Locate and plot points in a rectangular coordinate system (x,y plane)	1 2 3 4 5	1 2 3
62.	Apply absolute and incremental dimensioning	1 2 3 4 5	1 2 3
63.	Program dimension from engineering drawings using a point-to-point control system for a two-axis machine	1 2 3 4 5	1 2 3
64.	Code or decode numerical control tapes using the binary-decimal system	1 2 3 4 5	1 2 3

65. If you are an employer/supervisor are you satisfied with the mathematical performance of your employees (technical institute graduates)?

1. Yes 2. No

66. If you are an employee are you satisfied with your mathematical performance on the job?

1. Yes 2. No

67. If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

1. Yes 2. No

68. Please include here any additional mathematics tasks that you believe are needed:

69. Please include here any further general comments you may have:

If you have any questions, write to me or call (414) 497-3000.

Please return the questionnaire in the postage paid envelope. Thank you.

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QUESTIONNAIRE

The purpose of this questionnaire is to determine how essential the following mathematical tasks are in the performance of Automotive Mechanics work.

PART ONE

DIRECTIONS: Please fill in the blank, or circle the number that best indicates your response to the statement.

1. What is your present status?

   a. Employee

   b. Employer/Supervisor

2. What is your job description or job title?

   ____

OPTIONAL INFORMATION:

Name ____________________________________

Company ____________________________________

Address ____________________________________

____

If you would like a summary of the results, please check the box: ☐

100

PART TWO

DIRECTIONS:

(1) For Rating Scale

Circle the number on the "Rating Scale" that best indicates your response on how essential the task is in the performance of Automotive Mechanics work. Use the following responses:

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

(2) For Frequency Scale

Circle the number on the "Frequency of Use Scale" that best indicates your response on how often the task is used. Use the following responses:

1 = Never
2 = Occasionally
3 = Regularly

	RATING	FREQUENCY
EXAMPLE: Compute the area of a rectangle	1 2 3 4 5	1 2 3

The following is the list of mathematical tasks.

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
1. Say, read, write whole numbers	1 2 3 4 5	1 2 3
2. Add and subtract whole numbers	1 2 3 4 5	1 2 3
3. Multiply and divide whole numbers	1 2 3 4 5	1 2 3
4. Say, read, write fractions	1 2 3 4 5	1 2 3
5. Add and subtract fractions	1 2 3 4 5	1 2 3
6. Multiply and divide fractions	1 2 3 4 5	1 2 3
7. Read fractional divisions on a steel tape	1 2 3 4 5	1 2 3
8. Say, read, write decimals	1 2 3 4 5	1 2 3

RATING SCALE

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2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
9.	Convert fractions to decimals and vice versa	1 2 3 4 5	1 2 3
10.	Add and subtract decimals	1 2 3 4 5	1 2 3
11.	Multiply and divide decimals	1 2 3 4 5	1 2 3
12.	Round off numbers and decimals	1 2 3 4 5	1 2 3
13.	Use precision properly and given two measurements determine which is the most precise	1 2 3 4 5	1 2 3
14.	Estimate the results of arithmetic calculations before performing the calculations	1 2 3 4 5	1 2 3
15.	Use a calculator	1 2 3 4 5	1 2 3
16.	Find the square root of a number	1 2 3 4 5	1 2 3
17.	Find a percent of a number	1 2 3 4 5	1 2 3
18.	Find a number when a percent of it is known	1 2 3 4 5	1 2 3
19.	Find what percent one number is of another	1 2 3 4 5	1 2 3
20.	Use a decimal equivalent table	1 2 3 4 5	1 2 3
21.	Understand the basic geometric concepts of point, line, plane, parallel, perpendicular, and angles	1 2 3 4 5	1 2 3
22.	Understand the properties of basic geometric figures (triangle, rectangle, trapezoid, and circle)	1 2 3 4 5	1 2 3
23.	Read a micrometer	1 2 3 4 5	1 2 3
24.	Construct basic geometric figures	1 2 3 4 5	1 2 3
25.	Use common English and metric units of measure (length, weight, volume, temperature, time)	1 2 3 4 5	1 2 3
26.	Convert English to metric units and vice versa	1 2 3 4 5	1 2 3
27.	Find the perimeters of basic geometric figures	1 2 3 4 5	1 2 3
28.	Read a rule	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
29.	Use the metric system	1 2 3 4 5	1 2 3
30.	Find the areas of basic geometric figures	1 2 3 4 5	1 2 3
31.	Find the surface area of a cylinder	1 2 3 4 5	1 2 3
32.	Find the surface area of a box	1 2 3 4 5	1 2 3
33.	Find the volume of rectangular solids	1 2 3 4 5	1 2 3
34.	Find the volume of cylindrical solids	1 2 3 4 5	1 2 3
35.	Find the capacity of a rectangular solid (a tank in gallons)	1 2 3 4 5	1 2 3
36.	Find the capacity of a cylindrical solid (a tank in gallons)	1 2 3 4 5	1 2 3
37.	Calculate the weight of an object	1 2 3 4 5	1 2 3
38.	Estimate the cost to complete a job (materials and labor)	1 2 3 4 5	1 2 3
39.	Add and subtract angles	1 2 3 4 5	1 2 3
40.	Measure angles	1 2 3 4 5	1 2 3
41.	Lay out and drill equally space holes	1 2 3 4 5	1 2 3
42.	Use right, acute and obtuse angles	1 2 3 4 5	1 2 3
43.	Use a square for direct and indirect measurement	1 2 3 4 5	1 2 3
44.	Measure from scale drawings	1 2 3 4 5	1 2 3
45.	Solve ratio problems (gear ratio, compression ratio, differential ratio, air-fuel ratio)	1 2 3 4 5	1 2 3
46.	Solve a proportion problem (gear trains, gear reduction)	1 2 3 4 5	1 2 3
47.	Solve a formula for any indicated variable	1 2 3 4 5	1 2 3
48.	Substitute in a formula	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
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5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
49.	Know the strategies of problem solving	1 2 3 4 5	1 2 3
50.	Solve applied word problems	1 2 3 4 5	1 2 3
51.	Solve problems related to Automotive Mechanics	1 2 3 4 5	1 2 3
52.	Use a right triangle	1 2 3 4 5	1 2 3
53.	Solve a right triangle	1 2 3 4 5	1 2 3
54.	Find the length of the unknown side of a right triangle (using the pythagorean theorem)	1 2 3 4 5	1 2 3
55.	Compute R.P.M. and angular velocity	1 2 3 4 5	1 2 3
56.	Read and plot information in a line graph or bar chart	1 2 3 4 5	1 2 3
57.	Know computer capabilities and operations	1 2 3 4 5	1 2 3
58.	Use a computer	1 2 3 4 5	1 2 3
59.	Calculate an average	1 2 3 4 5	1 2 3
60.	Calculate tolerances	1 2 3 4 5	1 2 3
61.	Calculate discounts	1 2 3 4 5	1 2 3
62.	Calculate markup	1 2 3 4 5	1 2 3
63.	Calculate profit	1 2 3 4 5	1 2 3
64.	Calculate loss	1 2 3 4 5	1 2 3
65.	Calculate commission on a sale	1 2 3 4 5	1 2 3
66.	Calculate interest on a loan (or savings)	1 2 3 4 5	1 2 3
67.	Calculate taxes (sales)	1 2 3 4 5	1 2 3
68.	Calculate percent error	1 2 3 4 5	1 2 3
69.	Do the calculations on repair orders or shop tickets	1 2 3 4 5	1 2 3

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RATING SCALE

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4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
70.	Use formulas to calculate horsepower, efficiency or OHM's Law	1 2 3 4 5	1 2 3
71.	Calculate the displacement of an engine	1 2 3 4 5	1 2 3
72.	Use metric conversion	1 2 3 4 5	1 2 3
73.	Determine degrees crank shaft turns on firings and strokes	1 2 3 4 5	1 2 3
74.	Calculate turning radius	1 2 3 4 5	1 2 3
75.	Calculate tapers	1 2 3 4 5	1 2 3

76. If you are an employer/supervisor, are you satisfied with the mathematical performance of your employees (technical institute graduates)?

1. Yes 2. No

77. If you are an employee are you satisfied with your mathematical performance on the job?

1. Yes 2. No

78. If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

1. Yes 2. No

79. Please include here any additional mathematics tasks that you believe are needed.

80. Please include here any further general comments you may have.

If you have any questions, write to me or call (414) 497-3000.
Please return the questionnaire in the postage paid envelope. Thank you.

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QUESTIONNAIRE

The purpose of this questionnaire is to determine how essential the following mathematical tasks are in the performance of AUTO PARTS work.

PART ONE

DIRECTIONS: Please fill in the blank, or circle the number that best indicates your response to the statement.

1. What is your present status?

   a. Employee

   b. Employer/Supervisor

2. What is your job description or job title?

   ____

OPTIONAL INFORMATION:

Name ______________________________

Company ______________________________

Address ______________________________

____

If you would like a summary of the results, please check the box: ☐

PART TWO

DIRECTIONS:

(1) For Rating Scale

Circle the number on the "Rating Scale" that best indicates your response on how essential the task is in the performance of AUTO PARTS work. Use the following responses:

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

(2) For Frequency Scale

Circle the number on the "Frequency of Use Scale" that best indicates your response on how often the task is used. Use the following responses:

1 = Never
2 = Occasionally
3 = Regularly

	RATING	FREQUENCY
EXAMPLE: Compute the area of a rectangle	1 2 3 4 5	1 2 3

The following is the list of mathematical tasks.

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
1. Say, read, write whole numbers	1 2 3 4 5	1 2 3
2. Add and subtract whole numbers	1 2 3 4 5	1 2 3
3. Multiply and divide whole numbers	1 2 3 4 5	1 2 3
4. Say, read, write fractions	1 2 3 4 5	1 2 3
5. Add and subtract fractions	1 2 3 4 5	1 2 3
6. Multiply and divide fractions	1 2 3 4 5	1 2 3
7. Read fractional divisions on a steel tape	1 2 3 4 5	1 2 3
8. Say, read, write decimals	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
9.	Convert fractions to decimals and vice versa	1 2 3 4 5	1 2 3
10.	Add and subtract decimals	1 2 3 4 5	1 2 3
11.	Multiply and divide decimals	1 2 3 4 5	1 2 3
12.	Round off numbers and decimals	1 2 3 4 5	1 2 3
13.	Use precision properly and given two measurements determine which is the most precise	1 2 3 4 5	1 2 3
14.	Estimate the results of arithmetic calculations before performing the calculations	1 2 3 4 5	1 2 3
15.	Use a calculator	1 2 3 4 5	1 2 3
16.	Find the square root of a number	1 2 3 4 5	1 2 3
17.	Find a percent of a number	1 2 3 4 5	1 2 3
18.	Find a number when a percent of it is known	1 2 3 4 5	1 2 3
19.	Find what percent one number is of another	1 2 3 4 5	1 2 3
20.	Use a decimal equivalent table	1 2 3 4 5	1 2 3
21.	Understand the basic geometric concepts of point, line, plane, parallel, perpendicular, and angles	1 2 3 4 5	1 2 3
22.	Understand the properties of basic geometric figures (triangle, rectangle, trapezoid, and circle)	1 2 3 4 5	1 2 3
23.	Read a micrometer	1 2 3 4 5	1 2 3
24.	Construct basic geometric figures	1 2 3 4 5	1 2 3
25.	Use common English and metric units of measure (length, weight, volume, temperature, time)	1 2 3 4 5	1 2 3
26.	Convert English to metric units and vice versa	1 2 3 4 5	1 2 3
27.	Find the perimeters of basic geometric figures	1 2 3 4 5	1 2 3
28.	Read a rule	1 2 3 4 5	1 2 3

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FREQUENCY SCALE

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MATHEMATICAL TASKS		RESPONSES	
		RATING	FREQUENCY
29.	Use the metric system	1 2 3 4 5	1 2 3
30.	Find the areas of basic geometric figures	1 2 3 4 5	1 2 3
31.	Find the surface area of a cylinder	1 2 3 4 5	1 2 3
32.	Find the surface area of a box	1 2 3 4 5	1 2 3
33.	Find the volume of rectangular solids	1 2 3 4 5	1 2 3
34.	Find the volume of cylindrical solids	1 2 3 4 5	1 2 3
35.	Find the capacity of a rectangular solid (a tank in gallons)	1 2 3 4 5	1 2 3
36.	Find the capacity of a cylindrical solid (a tank in gallons)	1 2 3 4 5	1 2 3
37.	Calculate the weight of an object	1 2 3 4 5	1 2 3
38.	Estimate the cost to complete a job (materials and labor)	1 2 3 4 5	1 2 3
39.	Add and subtract angles	1 2 3 4 5	1 2 3
40.	Measure angles	1 2 3 4 5	1 2 3
41.	Lay out and drill equally space holes	1 2 3 4 5	1 2 3
42.	Use right, acute and obtuse angles	1 2 3 4 5	1 2 3
43.	Use a square for direct and indirect measurement	1 2 3 4 5	1 2 3
44.	Measure from scale drawings	1 2 3 4 5	1 2 3
45.	Solve ratio problems (gear ratio, compression ratio, differential ratio, air-fuel ratio)	1 2 3 4 5	1 2 3
46.	Solve a proportion problem (gear trains, gear reduction)	1 2 3 4 5	1 2 3
47.	Solve a formula for any indicated variable	1 2 3 4 5	1 2 3
48.	Substitute in a formula	1 2 3 4 5	1 2 3

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FREQUENCY SCALE

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3 = Regularly

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
49. Know the strategies of problem solving	1 2 3 4 5	1 2 3
50. Solve applied word problems	1 2 3 4 5	1 2 3
51. Solve problems related to Auto Parts	1 2 3 4 5	1 2 3
52. Use a right triangle	1 2 3 4 5	1 2 3
53. Solve a right triangle	1 2 3 4 5	1 2 3
54. Find the length of the unknown side of a right triangle (using the pythagorean theorem)	1 2 3 4 5	1 2 3
55. Compute R.P.M. and angular velocity	1 2 3 4 5	1 2 3
56. Read and plot information in a line graph or bar chart	1 2 3 4 5	1 2 3
57. Know computer capabilities and operations	1 2 3 4 5	1 2 3
58. Use a computer	1 2 3 4 5	1 2 3
59. Calculate an average	1 2 3 4 5	1 2 3
60. Calculate tolerances	1 2 3 4 5	1 2 3
61. Calculate discounts	1 2 3 4 5	1 2 3
62. Calculate markup	1 2 3 4 5	1 2 3
63. Calculate profit	1 2 3 4 5	1 2 3
64. Calculate loss	1 2 3 4 5	1 2 3
65. Calculate commission on a sale	1 2 3 4 5	1 2 3
66. Calculate interest on a loan (or savings)	1 2 3 4 5	1 2 3
67. Calculate taxes (sales)	1 2 3 4 5	1 2 3
68. Calculate percent error	1 2 3 4 5	1 2 3
69. Do the calculations on repair orders or shop tickets	1 2 3 4 5	1 2 3

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RATING SCALE

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FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
70. Use formulas to calculate horsepower, efficiency or OHM's Law	1 2 3 4 5	1 2 3
71. Calculate the displacement of an engine	1 2 3 4 5	1 2 3
72. Use metric conversion	1 2 3 4 5	1 2 3
73. Determine degrees crank shaft turns on firings and strokes	1 2 3 4 5	1 2 3
74. Calculate turning radius	1 2 3 4 5	1 2 3
75. Calculate tapers	1 2 3 4 5	1 2 3

76. If you are an employer/supervisor, are you satisfied with the mathematical performance of your employees (technical institute graduates)?

1. Yes 2. No

77. If you are an employee are you satisfied with your mathematical performance on the job?

1. Yes 2. No

78. If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

1. Yes 2. No

79. Please include here any additional mathematics tasks that you believe are needed.

80. Please include here any further general comments you may have.

If you have any questions, write to me or call (414) 497-3000.
Please return the questionnaire in the postage paid envelope. Thank you.

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QUESTIONNAIRE

The purpose of this questionnaire is to determine how essential the following mathematical tasks are in the performance of AUTO BODY work.

PART ONE

DIRECTIONS: Please fill in the blank, or circle the number that best indicates your response to the statement.

1. What is your present status?
   a. Employee
   b. Employer/Supervisor
2. What is your job description or job title?

   ____

OPTIONAL INFORMATION:

Name ______________________________

Company ______________________________

Address ______________________________

____

If you would like a summary of the results, please check the box: ☐

PART TWO

DIRECTIONS:

(1) For Rating Scale

Circle the number on the "Rating Scale" that best indicates your response on how essential the task is in the performance of AUTO BODY work. Use the following responses:

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

(2) For Frequency Scale

Circle the number on the "Frequency of Use Scale" that best indicates your response on how often the task is used. Use the following responses:

1 = Never
2 = Occasionally
3 = Regularly

	RATING	FREQUENCY
EXAMPLE: Compute the area of a rectangle	1 2 3 4 5	1 2 3

The following is the list of mathematical tasks.

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
1. Say, read, write whole numbers	1 2 3 4 5	1 2 3
2. Add and subtract whole numbers	1 2 3 4 5	1 2 3
3. Multiply and divide whole numbers	1 2 3 4 5	1 2 3
4. Say, read, write fractions	1 2 3 4 5	1 2 3
5. Add and subtract fractions	1 2 3 4 5	1 2 3
6. Multiply and divide fractions	1 2 3 4 5	1 2 3
7. Read fractional divisions on a steel tape	1 2 3 4 5	1 2 3
8. Say, read, write decimals	1 2 3 4 5	1 2 3

RATING SCALE

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FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
9.	Convert fractions to decimals and vice versa	1 2 3 4 5	1 2 3
10.	Add and subtract decimals	1 2 3 4 5	1 2 3
11.	Multiply and divide decimals	1 2 3 4 5	1 2 3
12.	Round off numbers and decimals	1 2 3 4 5	1 2 3
13.	Use precision properly and given two measurements determine which is the most precise	1 2 3 4 5	1 2 3
14.	Estimate the results of arithmetic calculations before performing the calculations	1 2 3 4 5	1 2 3
15.	Use a calculator	1 2 3 4 5	1 2 3
16.	Find the square root of a number	1 2 3 4 5	1 2 3
17.	Find a percent of a number	1 2 3 4 5	1 2 3
18.	Find a number when a percent of it is known	1 2 3 4 5	1 2 3
19.	Find what percent one number is of another	1 2 3 4 5	1 2 3
20.	Use a decimal equivalent table	1 2 3 4 5	1 2 3
21.	Understand the basic geometric concepts of point, line, plane, parallel, perpendicular, and angles	1 2 3 4 5	1 2 3
22.	Understand the properties of basic geometric figures (triangle, rectangle, trapezoid, and circle)	1 2 3 4 5	1 2 3
23.	Read a micrometer	1 2 3 4 5	1 2 3
24.	Construct basic geometric figures	1 2 3 4 5	1 2 3
25.	Use common English and metric units of measure (length, weight, volume, temperature, time)	1 2 3 4 5	1 2 3
26.	Convert English to metric units and vice versa	1 2 3 4 5	1 2 3
27.	Find the perimeters of basic geometric figures	1 2 3 4 5	1 2 3
28.	Read a rule	1 2 3 4 5	1 2 3

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FREQUENCY SCALE

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	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
29.	Use the metric system	1 2 3 4 5	1 2 3
30.	Find the areas of basic geometric figures	1 2 3 4 5	1 2 3
31.	Find the surface area of a cylinder	1 2 3 4 5	1 2 3
32.	Find the surface area of a box	1 2 3 4 5	1 2 3
33.	Find the volume of rectangular solids	1 2 3 4 5	1 2 3
34.	Find the volume of cylindrical solids	1 2 3 4 5	1 2 3
35.	Find the capacity of a rectangular solid (a tank in gallons)	1 2 3 4 5	1 2 3
36.	Find the capacity of a cylindrical solid (a tank in gallons)	1 2 3 4 5	1 2 3
37.	Calculate the weight of an object	1 2 3 4 5	1 2 3
38.	Estimate the cost to complete a job (materials and labor)	1 2 3 4 5	1 2 3
39.	Add and subtract angles	1 2 3 4 5	1 2 3
40.	Measure angles	1 2 3 4 5	1 2 3
41.	Lay out and drill equally space holes	1 2 3 4 5	1 2 3
42.	Use right, acute and obtuse angles	1 2 3 4 5	1 2 3
43.	Use a square for direct and indirect measurement	1 2 3 4 5	1 2 3
44.	Measure from scale drawings	1 2 3 4 5	1 2 3
45.	Solve ratio problems (gear ratio, compression ratio, differential ratio, air-fuel ratio)	1 2 3 4 5	1 2 3
46.	Solve a proportion problem (gear trains, gear reduction)	1 2 3 4 5	1 2 3
47.	Solve a formula for any indicated variable	1 2 3 4 5	1 2 3
48.	Substitute in a formula	1 2 3 4 5	1 2 3

RATING SCALE

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5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
49.	Know the strategies of problem solving	1 2 3 4 5	1 2 3
50.	Solve applied word problems	1 2 3 4 5	1 2 3
51.	Solve problems related to Auto Body	1 2 3 4 5	1 2 3
52.	Use a right triangle	1 2 3 4 5	1 2 3
53.	Solve a right triangle	1 2 3 4 5	1 2 3
54.	Find the length of the unknown side of a right triangle (using the pythagorean theorem)	1 2 3 4 5	1 2 3
55.	Compute R.P.M. and angular velocity	1 2 3 4 5	1 2 3
56.	Read and plot information in a line graph or bar chart	1 2 3 4 5	1 2 3
57.	Know computer capabilities and operations	1 2 3 4 5	1 2 3
58.	Use a computer	1 2 3 4 5	1 2 3
59.	Calculate an average	1 2 3 4 5	1 2 3
60.	Calculate tolerances	1 2 3 4 5	1 2 3
61.	Calculate discounts	1 2 3 4 5	1 2 3
62.	Calculate markup	1 2 3 4 5	1 2 3
63.	Calculate profit	1 2 3 4 5	1 2 3
64.	Calculate loss	1 2 3 4 5	1 2 3
65.	Calculate commission on a sale	1 2 3 4 5	1 2 3
66.	Calculate interest on a loan (or savings)	1 2 3 4 5	1 2 3
67.	Calculate taxes (sales)	1 2 3 4 5	1 2 3
68.	Calculate percent error	1 2 3 4 5	1 2 3
69.	Do the calculations on repair orders or shop tickets	1 2 3 4 5	1 2 3

RATING SCALE

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3 = Important
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5 = Essential

FREQUENCY SCALE

1 = Never
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	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
70.	Use formulas to calculate horsepower, efficiency or OHM's Law	1 2 3 4 5	1 2 3
71.	Calculate the displacement of an engine	1 2 3 4 5	1 2 3
72.	Use metric conversion	1 2 3 4 5	1 2 3
73.	Determine degrees crank shaft turns on firings and strokes	1 2 3 4 5	1 2 3
74.	Calculate turning radius	1 2 3 4 5	1 2 3
75.	Calculate tapers	1 2 3 4 5	1 2 3

76. If you are an employer/supervisor, are you satisfied with the mathematical performance of your employees (technical institute graduates)?

1. Yes 2. No

77. If you are an employee are you satisfied with your mathematical performance on the job?

1. Yes 2. No

78. If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

1. Yes 2. No

79. Please include here any additional mathematics tasks that you believe are needed.

80. Please include here any further general comments you may have.

If you have any questions, write to me or call (414) 497-3000.
Please return the questionnaire in the postage paid envelope. Thank you.

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QUESTIONNAIRE

The purpose of this questionnaire is to determine how essential the following mathematical tasks are in the performance of DIESEL MECHANICS work.

PART ONE

DIRECTIONS: Please fill in the blank, or circle the number that best indicates your response to the statement.

1. What is your present status?
    a. Employee
    b. Employer/Supervisor
2. What is your job description or job title?

    ____

OPTIONAL INFORMATION:

Name ________________________________

Company ________________________________

Address ________________________________

____

If you would like a summary of the results, please check the box: ☐

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PART TWO

DIRECTIONS:

(1) For Rating Scale

Circle the number on the "Rating Scale" that best indicates your response on how essential the task is in the performance of Diesel Mechanics work. Use the following responses:

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

(2) For Frequency Scale

Circle the number on the "Frequency of Use Scale" that best indicates your response on how often the task is used. Use the following responses:

1 = Never
2 = Occasionally
3 = Regularly

	RATING	FREQUENCY
EXAMPLE: Compute the area of a rectangle	1 2 3 4 5	1 2 3

The following is the list of mathematical tasks.

MATHEMATICAL TASKS	RESPONSES RATING	 FREQUENCY
1. Say, read, write whole numbers	1 2 3 4 5	1 2 3
2. Add and subtract whole numbers	1 2 3 4 5	1 2 3
3. Multiply and divide whole numbers	1 2 3 4 5	1 2 3
4. Say, read, write fractions	1 2 3 4 5	1 2 3
5. Add and subtract fractions	1 2 3 4 5	1 2 3
6. Multiply and divide fractions	1 2 3 4 5	1 2 3
7. Read fractional divisions on a steel tape	1 2 3 4 5	1 2 3
8. Say, read, write decimals	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
9.	Convert fractions to decimals and vice versa	1 2 3 4 5	1 2 3
10.	Add and subtract decimals	1 2 3 4 5	1 2 3
11.	Multiply and divide decimals	1 2 3 4 5	1 2 3
12.	Round off numbers and decimals	1 2 3 4 5	1 2 3
13.	Use precision properly and given two measurements determine which is the most precise	1 2 3 4 5	1 2 3
14.	Estimate the results of arithmetic calculations before performing the calculations	1 2 3 4 5	1 2 3
15.	Use a calculator	1 2 3 4 5	1 2 3
16.	Find the square root of a number	1 2 3 4 5	1 2 3
17.	Find a percent of a number	1 2 3 4 5	1 2 3
18.	Find a number when a percent of it is known	1 2 3 4 5	1 2 3
19.	Find what percent one number is of another	1 2 3 4 5	1 2 3
20.	Use a decimal equivalent table	1 2 3 4 5	1 2 3
21.	Understand the basic geometric concepts of point, line, plane, parallel, perpendicular, and angles	1 2 3 4 5	1 2 3
22.	Understand the properties of basic geometric figures (triangle, rectangle, trapezoid, and circle)	1 2 3 4 5	1 2 3
23.	Read a micrometer	1 2 3 4 5	1 2 3
24.	Construct basic geometric figures	1 2 3 4 5	1 2 3
25.	Use common English and metric units of measure (length, weight, volume, temperature, time)	1 2 3 4 5	1 2 3
26.	Convert English to metric units and vice versa	1 2 3 4 5	1 2 3
27.	Find the perimeters of basic geometric figures	1 2 3 4 5	1 2 3
28.	Read a rule	1 2 3 4 5	1 2 3

RATING SCALE

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FREQUENCY SCALE

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	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
29.	Use the metric system	1 2 3 4 5	1 2 3
30.	Find the areas of basic geometric figures	1 2 3 4 5	1 2 3
31.	Find the surface area of a cylinder	1 2 3 4 5	1 2 3
32.	Find the surface area of a box	1 2 3 4 5	1 2 3
33.	Find the volume of rectangular solids	1 2 3 4 5	1 2 3
34.	Find the volume of cylindrical solids	1 2 3 4 5	1 2 3
35.	Find the capacity of a rectangular solid (a tank in gallons)	1 2 3 4 5	1 2 3
36.	Find the capacity of a cylindrical solid (a tank in gallons)	1 2 3 4 5	1 2 3
37.	Calculate the weight of an object	1 2 3 4 5	1 2 3
38.	Estimate the cost to complete a job (materials and labor)	1 2 3 4 5	1 2 3
39.	Add and subtract angles	1 2 3 4 5	1 2 3
40.	Measure angles	1 2 3 4 5	1 2 3
41.	Lay out and drill equally space holes	1 2 3 4 5	1 2 3
42.	Use right, acute and obtuse angles	1 2 3 4 5	1 2 3
43.	Use a square for direct and indirect measurement	1 2 3 4 5	1 2 3
44.	Measure from scale drawings	1 2 3 4 5	1 2 3
45.	Solve ratio problems (gear ratio, compression ratio, differential ratio, air-fuel ratio)	1 2 3 4 5	1 2 3
46.	Solve a proportion problem (gear trains, gear reduction)	1 2 3 4 5	1 2 3
47.	Solve a formula for any indicated variable	1 2 3 4 5	1 2 3
48.	Substitute in a formula	1 2 3 4 5	1 2 3

RATING SCALE	FREQUENCY SCALE
1 = Not Important	1 = Never
2 = Slightly Important	2 = Occasionally
3 = Important	3 = Regularly
4 = Very Important	
5 = Essential	

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
49.	Know the strategies of problem solving	1 2 3 4 5	1 2 3
50.	Solve applied word problems	1 2 3 4 5	1 2 3
51.	Solve problems related to Diesel Mechanics	1 2 3 4 5	1 2 3
52.	Use a right triangle	1 2 3 4 5	1 2 3
53.	Solve a right triangle	1 2 3 4 5	1 2 3
54.	Find the length of the unknown side of a right triangle (using the pythagorean theorem)	1 2 3 4 5	1 2 3
55.	Compute R.P.M. and angular velocity	1 2 3 4 5	1 2 3
56.	Read and plot information in a line graph or bar chart	1 2 3 4 5	1 2 3
57.	Know computer capabilities and operations	1 2 3 4 5	1 2 3
58.	Use a computer	1 2 3 4 5	1 2 3
59.	Calculate an average	1 2 3 4 5	1 2 3
60.	Calculate tolerances	1 2 3 4 5	1 2 3
61.	Calculate discounts	1 2 3 4 5	1 2 3
62.	Calculate markup	1 2 3 4 5	1 2 3
63.	Calculate profit	1 2 3 4 5	1 2 3
64.	Calculate loss	1 2 3 4 5	1 2 3
65.	Calculate commission on a sale	1 2 3 4 5	1 2 3
66.	Calculate interest on a loan (or savings)	1 2 3 4 5	1 2 3
67.	Calculate taxes (sales)	1 2 3 4 5	1 2 3
68.	Calculate percent error	1 2 3 4 5	1 2 3
69.	Do the calculations on repair orders or shop tickets	1 2 3 4 5	1 2 3

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RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
70. Use formulas to calculate horsepower, efficiency or OHM's Law	1 2 3 4 5	1 2 3
71. Calculate the displacement of an engine	1 2 3 4 5	1 2 3
72. Use metric conversion	1 2 3 4 5	1 2 3
73. Determine degrees crank shaft turns on firings and strokes	1 2 3 4 5	1 2 3
74. Calculate turning radius	1 2 3 4 5	1 2 3
75. Calculate tapers	1 2 3 4 5	1 2 3

76. If you are an employer/supervisor, are you satisfied with the mathematical performance of your employees (technical institute graduates)?

1. Yes 2. No

77. If you are an employee are you satisfied with your mathematical performance on the job?

1. Yes 2. No

78. If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

1. Yes 2. No

79. Please include here any additional mathematics tasks that you believe are needed.

80. Please include here any further general comments you may have.

If you have any questions, write to me or call (414) 497-3000.
Please return the questionnaire in the postage paid envelope. Thank you.

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QUESTIONNAIRE

The purpose of this questionnaire is to determine how essential the following mathematical tasks are in the performance of Welding work.

PART ONE

DIRECTIONS: Please fill in the blank, or circle the number that best indicates your response to the statement.

1. What is your present status?
   a. Employee
   b. Employer/Supervisor
2. What is your job description or job title?

   ____

- -

OPTIONAL INFORMATION:

Name ______________________________

Company ______________________________

Address ______________________________

____

If you would like a summary of the results, please check the box: ☐

PART TWO

DIRECTIONS:

(1) For Rating Scale

Circle the number on the "Rating Scale" that best indicates your response on how essential the task is in the performance of Welding work. Use the following responses:

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

(2) For Frequency Scale

Circle the number on the "Frequency of Use Scale" that best indicates your response on how often the task is used. Use the following responses:

1 = Never
2 = Occasionally
3 = Regularly

	RATING	FREQUENCY
EXAMPLE: Compute the area of a rectangle	1 2 3 4 5	1 2 3

The following is the list of mathematical tasks.

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
1.	Say, read, write whole numbers	1 2 3 4 5	1 2 3
2.	Add and subtract whole numbers	1 2 3 4 5	1 2 3
3.	Multiply and divide whole numbers	1 2 3 4 5	1 2 3
4.	Say, read, write fractions	1 2 3 4 5	1 2 3
5.	Add and subtract fractions	1 2 3 4 5	1 2 3
6.	Multiply and divide fractions	1 2 3 4 5	1 2 3
7.	Read fractional divisions on a steel tape	1 2 3 4 5	1 2 3
8.	Say, read, write decimals	1 2 3 4 5	1 2 3

RATING SCALE

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4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
9.	Convert fractions to decimals and vice versa	1 2 3 4 5	1 2 3
10.	Add and subtract decimals	1 2 3 4 5	1 2 3
11.	Multiply and divide decimals	1 2 3 4 5	1 2 3
12.	Round off numbers and decimals	1 2 3 4 5	1 2 3
13.	Use precision properly and given two measurements determine which is the most precise	1 2 3 4 5	1 2 3
14.	Estimate the results of arithmetic calculations before performing the calculations	1 2 3 4 5	1 2 3
15.	Use a calculator	1 2 3 4 5	1 2 3
16.	Find the square root of a number	1 2 3 4 5	1 2 3
17.	Find a percent of a number	1 2 3 4 5	1 2 3
18.	Find a number when a percent of it is known	1 2 3 4 5	1 2 3
19.	Find what percent one number is of another	1 2 3 4 5	1 2 3
20.	Use a decimal equivalent table	1 2 3 4 5	1 2 3
21.	Understand the basic geometric concepts of point, line, plane, parallel, perpendicular, and angles	1 2 3 4 5	1 2 3
22.	Understand the properties of basic geometric figures (triangle, rectangle, trapezoid, and circle)	1 2 3 4 5	1 2 3
23.	Read a micrometer	1 2 3 4 5	1 2 3
24.	Construct basic geometric figures	1 2 3 4 5	1 2 3
25.	Use common english and metric units of measure (length, weight, volume, temperature, time)	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
26.	Convert english to metric units and vice versa	1 2 3 4 5	1 2 3
27.	Find the perimeters of basic geometric figures	1 2 3 4 5	1 2 3
28.	Read a rule	1 2 3 4 5	1 2 3
29.	Use the metric system	1 2 3 4 5	1 2 3
30.	Find the areas of basic geometric figures	1 2 3 4 5	1 2 3
31.	Find the surface area of a cylinder	1 2 3 4 5	1 2 3
32.	Find the surface area of a box	1 2 3 4 5	1 2 3
33.	Find the volume of rectangular solids	1 2 3 4 5	1 2 3
34.	Find the volume of cylindrical solids	1 2 3 4 5	1 2 3
35.	Find the capacity of a rectangular structure (a tank in gallons)	1 2 3 4 5	1 2 3
36.	Find the capacity of a cylindrical solid (a tank in gallons)	1 2 3 4 5	1 2 3
37.	Calculate the weight of a steel structure	1 2 3 4 5	1 2 3
38.	Estimate the cost to complete a job (materials and labor)	1 2 3 4 5	1 2 3
39.	Add and subtract angles	1 2 3 4 5	1 2 3
40.	Measure angles	1 2 3 4 5	1 2 3
41.	Lay out and drill equally space holes on a circle	1 2 3 4 5	1 2 3
42.	Use right, acute, and obtuse angles	1 2 3 4 5	1 2 3
43.	Use a square for direct and indirect measurement	1 2 3 4 5	1 2 3
44.	Measure from scale drawings	1 2 3 4 5	1 2 3

RATING SCALE

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2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

MATHEMATICAL TASKS		RESPONSES	
		RATING	FREQUENCY
45.	Solve ratio problems	1 2 3 4 5	1 2 3
46.	Solve a proportion problem	1 2 3 4 5	1 2 3
47.	Solve a formula for any indicated variable	1 2 3 4 5	1 2 3
48.	Substitute in a formula	1 2 3 4 5	1 2 3
49.	Know the strategies of problem solving	1 2 3 4 5	1 2 3
50.	Solve applied word problems	1 2 3 4 5	1 2 3
51.	Solve problems related to welding	1 2 3 4 5	1 2 3
52.	Use a right triangle	1 2 3 4 5	1 2 3
53.	Solve a right triangle	1 2 3 4 5	1 2 3
54.	Find the length of the unknown side of a right triangle (using the pythagorean theorem)	1 2 3 4 5	1 2 3
55.	Compute R.P.M. and angular velocity	1 2 3 4 5	1 2 3
56.	Read and plot information in a line graph or BAR chart	1 2 3 4 5	1 2 3
57.	Know computer capabilities and operations	1 2 3 4 5	1 2 3
58.	Use a computer in welding	1 2 3 4 5	1 2 3
59.	Calculate an average	1 2 3 4 5	1 2 3
60.	Calculate tolerances	1 2 3 4 5	1 2 3
61.	Apply the mathematics of quality control and precision inspection	1 2 3 4 5	1 2 3
62.	Find the bend allowance	1 2 3 4 5	1 2 3
63.	Calculate for stretchouts of square and rectangular shapes	1 2 3 4 5	1 2 3
64.	Calculate for stretchouts of circular and semi-circular shapes	1 2 3 4 5	1 2 3

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RATING SCALE

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3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

MATHEMATICAL TASKS	RESPONSES RATING	 FREQUENCY
65. Determine the most economical layout	1 2 3 4 5	1 2 3
66. Calculate waste	1 2 3 4 5	1 2 3
67. Calculate salary	1 2 3 4 5	1 2 3

68. If you are an employer/supervisor are you satisfied with the mathematical performance of your employees (technical institute graduates)?

1. Yes 2. No

69. If you are an employee are you satisfied with your mathematical performance on the job?

1. Yes 2. No

70. If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

1. Yes 2. No

71. Please include here any additional mathematics tasks that you believe are needed:

72. Please include here any further general comments you may have:

If you have any questions, write to me or call (414) 497-3000.

Please return the questionnaire in the postage paid envelope. Thank you.

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QUESTIONNAIRE

The purpose of this questionnaire is to determine how essential the following mathematical tasks are in the performance of RETAIL SALES work.

PART ONE

DIRECTIONS: Please fill in the blank, or circle the number that best indicates your response to the statement.

1. What is your present status?

   a. Employee

   b. Employer/Supervisor

2. What is your job description or job title?

   ____

- -

OPTIONAL INFORMATION:

Name ____

Company ____

Address ____

____

If you would like a summary of the results, please check the box: ☐

PART TWO

DIRECTIONS:

(1) For Rating Scale

Circle the number on the "Rating Scale" that best indicates your response on how essential the task is in the performance of RETAIL SALES work. Use the following responses:

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

(2) For Frequency Scale

Circle the number on the "Frequency of Use Scale" that best indicates your response on how often the task is used. Use the following responses:

1 = Never
2 = Occasionally
3 = Regularly

	RATING	FREQUENCY
EXAMPLE: Compute the area of a rectangle	1 2 3 4 5	1 2 3

The following is the list of mathematical tasks.

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
1. Perform numeric operations with whole numbers.......	1 2 3 4 5	1 2 3
2. Compare fractions, which is greater (or less than)..	1 2 3 4 5	1 2 3
3. Perform numeric operations with fractions...........	1 2 3 4 5	1 2 3
4. Reduce fractions to lowest terms....................	1 2 3 4 5	1 2 3
5. Compare decimals, which is greater (or less than)...	1 2 3 4 5	1 2 3
6. Convert fractions to decimals and vice versa........	1 2 3 4 5	1 2 3
7. Perform numeric operations with decimals............	1 2 3 4 5	1 2 3
8. Perform numeric operations with mixed numbers.......	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
9.	Round off numbers and decimals	1 2 3 4 5	1 2 3
10.	Use significant digits properly in calculations	1 2 3 4 5	1 2 3
11.	Estimate the results of numeric operations before performing the calculations	1 2 3 4 5	1 2 3
12.	Use a calculator	1 2 3 4 5	1 2 3
13.	Complete a sales slip	1 2 3 4 5	1 2 3
14.	Prepare an invoice	1 2 3 4 5	1 2 3
15.	Compute net sales, given returns and allowances	1 2 3 4 5	1 2 3
16.	Define percentage	1 2 3 4 5	1 2 3
17.	Convert fractions to decimals, decimals to percent, fractions to percent and vice versa	1 2 3 4 5	1 2 3
18.	Determine percentage, base, or rate given any two of the three	1 2 3 4 5	1 2 3
19.	Compute sales tax amounts for merchandise sold	1 2 3 4 5	1 2 3
20.	Express profit as a percent of sales	1 2 3 4 5	1 2 3
21.	Compute sales given sales tax paid and the sales tax rate	1 2 3 4 5	1 2 3
22.	Compute reduced selling prices given markdown percents	1 2 3 4 5	1 2 3
23.	Compute selling price given cost and markup based on cost	1 2 3 4 5	1 2 3
24.	Compute selling price given cost and markup based on selling price	1 2 3 4 5	1 2 3
25.	Solve problems using common English and metric units of measure (length, weight, volume, temperature, and/or time)	1 2 3 4 5	1 2 3
26.	Read a rule (English and/or metric)	1 2 3 4 5	1 2 3
27.	Measure from scale drawings	1 2 3 4 5	1 2 3

RATING SCALE	FREQUENCY SCALE
1 = Not Important	1 = Never
2 = Slightly Important	2 = Occasionally
3 = Important	3 = Regularly
4 = Very Important	
5 = Essential	

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
28.	Understand the properties of perpendicular and parallel lines	1 2 3 4 5	1 2 3
29.	Determine the area of a circle, rectangle, or triangle (display area)	1 2 3 4 5	1 2 3
30.	Find the distance around simple geometric figures (perimeter)	1 2 3 4 5	1 2 3
31.	Find the volume of various geometric solids (cylinders, cubes, cones, pyramids)	1 2 3 4 5	1 2 3
32.	Measure angles using a protractor	1 2 3 4 5	1 2 3
33.	Graph a straight line in a rectangular coordinate system	1 2 3 4 5	1 2 3
34.	Perform numeric operations with signed numbers (+ or −)	1 2 3 4 5	1 2 3
35.	Compute a series numeric expression involving grouping symbols (parenthesis, etc.)	1 2 3 4 5	1 2 3
36.	Solve ratio problems	1 2 3 4 5	1 2 3
37.	Solve direct proportion problems	1 2 3 4 5	1 2 3
38.	Solve inverse proportion problems	1 2 3 4 5	1 2 3
39.	Calculate financial ratios (turnover, working capitol, acid test, accounts receivable to sales, etc.)	1 2 3 4 5	1 2 3
40.	Perform algebraic addition, subtraction, multiplication, and division (simplify)	1 2 3 4 5	1 2 3
41.	Solve simple algebraic equations with one unknown ($3x=12$)	1 2 3 4 5	1 2 3
42.	Substitute in a formula	1 2 3 4 5	1 2 3
43.	Compute gross margin given revenue and cost of goods sold	1 2 3 4 5	1 2 3

RATING SCALE

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FREQUENCY SCALE

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	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
44.	Compute net profit for a given retail situation	1 2 3 4 5	1 2 3
45.	Compute maintained markup	1 2 3 4 5	1 2 3
46.	Compute average markup	1 2 3 4 5	1 2 3
47.	Estimate the inventory value by use of one of the following methods: average stock, FIFO, LIFO, or specific identification	1 2 3 4 5	1 2 3
48.	Forecast sales by use of one of the following methods: survey, add on percentage, time series analysis or regression theory	1 2 3 4 5	1 2 3
49.	Prepare a merchandise plan	1 2 3 4 5	1 2 3
50.	Construct a bar chart, graph, pie graph, or line graph to present data	1 2 3 4 5	1 2 3
51.	Compute measures of central tendency (mean, mode, or median)	1 2 3 4 5	1 2 3
52.	Prepare a stock plan	1 2 3 4 5	1 2 3
53.	Understand computer capabilities and applications in problem solving	1 2 3 4 5	1 2 3
54.	Use a computer to enter sales or check on inventories.	1 2 3 4 5	1 2 3

55. If you are an employer/supervisor are you satisfied with the mathematical performance of your employees (technical institute graduates?

1. Yes   2. No

56. If you are an employee are you satisfied with your mathematical performance on the job?

1. Yes   2. No

57. If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

1. Yes   2. No

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58. Please include here any additional mathematics tasks that you believe are needed:

59. Please include here any further general comments you may have:

If you have any questions, write to me or call (414) 497-3000.

Please return the questionnaire in the postage paid envelope. Thank you.

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QUESTIONNAIRE

The purpose of this questionnaire is to determine how essential the following mathematical tasks are in the performance of SALES MANAGEMENT work.

PART ONE

DIRECTIONS: Please fill in the blank, or circle the number that best indicates your response to the statement.

1. What is your present status?

   a. Employee

   b. Employer/Supervisor

2. What is your job description or job title?

   ____

OPTIONAL INFORMATION:

Name ______________________________

Company ______________________________

Address ______________________________

____

If you would like a summary of the results, please check the box: ☐

PART TWO

DIRECTIONS:

(1) For Rating Scale

Circle the number on the "Rating Scale" that best indicates your response on how essential the task is in the performance of **SALES MANAGEMENT** work. Use the following responses:

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

(2) For Frequency Scale

Circle the number on the "Frequency of Use Scale" that best indicates your response on how often the task is used. Use the following responses:

1 = Never
2 = Occasionally
3 = Regularly

	RATING	FREQUENCY
EXAMPLE: Compute the area of a rectangle	1 2 3 4 5	1 2 3

The following is the list of mathematical tasks.

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
1. Perform numeric operations with whole numbers.......	1 2 3 4 5	1 2 3
2. Compare fractions, which is greater (or less than)..	1 2 3 4 5	1 2 3
3. Perform numeric operations with fractions..........	1 2 3 4 5	1 2 3
4. Reduce fractions to lowest terms....................	1 2 3 4 5	1 2 3
5. Compare decimals, which is greater (or less than)...	1 2 3 4 5	1 2 3
6. Convert fractions to decimals and vice versa........	1 2 3 4 5	1 2 3
7. Perform numeric operations with decimals............	1 2 3 4 5	1 2 3
8. Perform numeric operations with mixed numbers.......	1 2 3 4 5	1 2 3

RATING SCALE

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3 = Important
4 = Very Important
5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
9.	Round off numbers and decimals	1 2 3 4 5	1 2 3
10.	Use significant digits properly in calculations	1 2 3 4 5	1 2 3
11.	Estimate the results of numeric operations before performing the calculations	1 2 3 4 5	1 2 3
12.	Use a calculator	1 2 3 4 5	1 2 3
13.	Complete a sales slip	1 2 3 4 5	1 2 3
14.	Prepare an invoice	1 2 3 4 5	1 2 3
15.	Compute net sales, given returns and allowances	1 2 3 4 5	1 2 3
16.	Define percentage	1 2 3 4 5	1 2 3
17.	Convert fractions to decimals, decimals to percent, fractions to percent and vice versa	1 2 3 4 5	1 2 3
18.	Determine percentage, base, or rate given any two of the three	1 2 3 4 5	1 2 3
19.	Compute sales tax amounts for merchandise sold	1 2 3 4 5	1 2 3
20.	Express profit as a percent of sales	1 2 3 4 5	1 2 3
21.	Compute sales given sales tax paid and the sales tax rate	1 2 3 4 5	1 2 3
22.	Compute reduced selling prices given markdown percents	1 2 3 4 5	1 2 3
23.	Compute selling price given cost and markup based on cost	1 2 3 4 5	1 2 3
24.	Compute selling price given cost and markup based on selling price	1 2 3 4 5	1 2 3
25.	Solve problems using common English and metric units of measure (length, weight, volume, temperature, and/or time)	1 2 3 4 5	1 2 3
26.	Read a rule (English and/or metric)	1 2 3 4 5	1 2 3
27.	Measure from scale drawings	1 2 3 4 5	1 2 3

RATING SCALE

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2 = Slightly Important
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FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
28.	Understand the properties of perpendicular and parallel lines	1 2 3 4 5	1 2 3
29.	Determine the area of a circle, rectangle, or triangle (display area)	1 2 3 4 5	1 2 3
30.	Find the distance around simple geometric figures (perimeter)	1 2 3 4 5	1 2 3
31.	Find the volume of various geometric solids (cylinders, cubes, cones, pyramids)	1 2 3 4 5	1 2 3
32.	Measure angles using a protractor	1 2 3 4 5	1 2 3
33.	Graph a straight line in a rectangular coordinate system	1 2 3 4 5	1 2 3
34.	Perform numeric operations with signed numbers (+ or -)	1 2 3 4 5	1 2 3
35.	Compute a series numeric expression involving grouping symbols (parenthesis, etc.)	1 2 3 4 5	1 2 3
36.	Solve ratio problems	1 2 3 4 5	1 2 3
37.	Solve direct proportion problems	1 2 3 4 5	1 2 3
38.	Solve inverse proportion problems	1 2 3 4 5	1 2 3
39.	Calculate financial ratios (turnover, working capitol, acid test, accounts receivable to sales, etc.)	1 2 3 4 5	1 2 3
40.	Perform algebraic addition, subtraction, multiplication, and division (simplify)	1 2 3 4 5	1 2 3
41.	Solve simple algebraic equations with one unknown (3x=12)	1 2 3 4 5	1 2 3
42.	Substitute in a formula	1 2 3 4 5	1 2 3
43.	Compute gross margin given revenue and cost of goods sold	1 2 3 4 5	1 2 3

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5 = Essential

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	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
44.	Compute net profit for a given retail situation	1 2 3 4 5	1 2 3
45.	Compute maintained markup	1 2 3 4 5	1 2 3
46.	Compute average markup	1 2 3 4 5	1 2 3
47.	Estimate the inventory value by use of one of the following methods: average stock, FIFO, LIFO, or specific identification	1 2 3 4 5	1 2 3
48.	Forecast sales by use of one of the following methods: survey, add on percentage, time series analysis or regression theory	1 2 3 4 5	1 2 3
49.	Prepare a merchandise plan	1 2 3 4 5	1 2 3
50.	Construct a bar chart, graph, pie graph, or line graph to present data	1 2 3 4 5	1 2 3
51.	Compute measures of central tendency (mean, mode, or median)	1 2 3 4 5	1 2 3
52.	Prepare a stock plan	1 2 3 4 5	1 2 3
53.	Understand computer capabilities and applications in problem solving	1 2 3 4 5	1 2 3
54.	Use a computer to enter sales or check on inventories.	1 2 3 4 5	1 2 3

55. If you are an employer/supervisor are you satisfied with the mathematical performance of your employees (technical institute graduates?

1. Yes 2. No

56. If you are an employee are you satisfied with your mathematical performance on the job?

1. Yes 2. No

57. If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

1. Yes 2. No

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58. Please include here any additional mathematics tasks that you believe are needed:

59. Please include here any further general comments you may have:

If you have any questions, write to me or call (414) 497-3000.

Please return the questionnaire in the postage paid envelope. Thank you.

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0	1	3			

QUESTIONNAIRE

The purpose of this questionnaire is to determine how essential the following mathematical tasks are in the performance of ELECTRICITY work.

PART ONE

DIRECTIONS: Please fill in the blank, or circle the number that best indicates your response to the statement.

1. What is your present status?
   a. Employee
   b. Employer/Supervisor
2. What is your job description or job title?

   ____

- -

OPTIONAL INFORMATION:

Name ______________________________

Company ______________________________

Address ______________________________

____

If you would like a summary of the results, please check the box: ☐

PART TWO

DIRECTIONS:

(1) For Rating Scale

Circle the number on the "Rating Scale" that best indicates your response on how essential the task is in the performance of ELECTRICITY work. Use the following responses:

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

(2) For Frequency Scale

Circle the number on the "Frequency of Use Scale" that best indicates your response on how often the task is used. Use the following responses:

1 = Never
2 = Occasionally
3 = Regularly

	RATING	FREQUENCY
EXAMPLE: Compute the area of a rectangle	1 2 3 4 5	1 2 3

The following is the list of mathematical tasks.

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
1. Perform numeric operations with whole numbers	1 2 3 4 5	1 2 3
2. Perform numeric operations with fractions	1 2 3 4 5	1 2 3
3. Perform numeric operations with decimals	1 2 3 4 5	1 2 3
4. Use significant digits properly in determining which of two numbers are more precise	1 2 3 4 5	1 2 3
5. Estimate the results of numeric operations before solving problems	1 2 3 4 5	1 2 3
6. Perform numeric operations with the aid of a calculator	1 2 3 4 5	1 2 3
7. Find square root and square a number	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
2 = Slightly Important
3 = Important
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5 = Essential

FREQUENCY SCALE

1 = Never
2 = Occasionally
3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
8.	Calculate the impedance of a circuit given its resistance and reactance	1 2 3 4 5	1 2 3
9.	Convert fractions to decimals, decimals to percent, fractions to percent and vice versa	1 2 3 4 5	1 2 3
10.	Determine percentage, base, or rates given any two of the three	1 2 3 4 5	1 2 3
11.	Calculate the efficiency of a motor given its input and output	1 2 3 4 5	1 2 3
12.	Calculate load voltage given supply voltage and maximum voltage drop percent	1 2 3 4 5	1 2 3
13.	Calculate the power input of a motor given its output and efficiency	1 2 3 4 5	1 2 3
14.	Understand properties of right triangles	1 2 3 4 5	1 2 3
15.	Measure from scale drawings	1 2 3 4 5	1 2 3
16.	Find the area of basic geometric figures (rectangle, triangle, and circle)	1 2 3 4 5	1 2 3
17.	Perform numeric operations with signed number (+ or -)	1 2 3 4 5	1 2 3
18.	Perform computations with scientific notation (powers of ten)	1 2 3 4 5	1 2 3
19.	Compute a series numeric expression involving grouping symbols (parentheses, etc.)	1 2 3 4 5	1 2 3
20.	Solve direct proportion problems	1 2 3 4 5	1 2 3
21.	Compute the resistance of 800 ft of wire if 200 feet of the same wire has a resistance of 4 ohms	1 2 3 4 5	1 2 3
22.	Solve inverse proportion problems	1 2 3 4 5	1 2 3
23.	Compute the resistance of No. 40 wire given No. 36 wire of the same length has a resistance of 27 ohms	1 2 3 4 5	1 2 3

RATING SCALE

1 = Not Important
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FREQUENCY SCALE

1 = Never
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MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
24. Calculate the resistance of wires of any diameter, any length, or any material	1 2 3 4 5	1 2 3
25. Solve simple algebraic equations with one unknown (3x=6, for x)	1 2 3 4 5	1 2 3
26. Substitute values into a formula and solve for the unknown	1 2 3 4 5	1 2 3
27. Determine capacitive reactance given frequency and capacitance	1 2 3 4 5	1 2 3
28. Plot a AC wave	1 2 3 4 5	1 2 3
29. Solve algebraic fractional equations	1 2 3 4 5	1 2 3
30. Calculate the total resistance in a parallel circuit.	1 2 3 4 5	1 2 3
31. Solve linear equations in two variables (graphically, substitution, addition, and subtraction)	1 2 3 4 5	1 2 3
32. Apply Kirchhoff's laws to electrical circuits	1 2 3 4 5	1 2 3
33. Read a trigonometric table to find the values of various trigonometric functions (SIN 30°, TAN 45°, etc.)	1 2 3 4 5	1 2 3
34. Apply the SINE, COSINE, and TANGENT functions to solving of right triangle problems	1 2 3 4 5	1 2 3
35. Calculate VA given watts and power factor (PF)	1 2 3 4 5	1 2 3
36. Calculate reactive current given in-phase current and phase angle	1 2 3 4 5	1 2 3
37. Calculate reactance given impedance and PF	1 2 3 4 5	1 2 3
38. Solve oblique triangles	1 2 3 4 5	1 2 3
39. Perform vector algebra	1 2 3 4 5	1 2 3
40. Calculate the power factor in a series AC resistive, inductive and capacitive circuit	1 2 3 4 5	1 2 3
41. Find the equivalent series circuit for a parallel resistive, inductive, and capacitive circuit	1 2 3 4 5	1 2 3

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FREQUENCY SCALE

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MATHEMATICAL TASKS	RESPONSES RATING	 FREQUENCY
42. Find the system capacity that has been released by an improvement in the power factor........................	1 2 3 4 5	1 2 3
43. Calculate the line voltage in a wye-connection, three phase circuit, given the phase voltage................	1 2 3 4 5	1 2 3
44. Calculate the power developed in each phase of a delta-connected, three phase circuit given the line current line voltage, and power factor........................	1 2 3 4 5	1 2 3

0	1	3			

45. If you are an employer/supervisor are you satisfied with the mathematical performance of your employees (technical institute graduates)?

1. Yes 2. No

46. If you are an employee are you satisfied with your mathematical performance on the job?

1. Yes 2. No

47. If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

1. Yes 2. No

48. Please include here any additional mathematics tasks that you believe are needed:

49. Please include here any further general comments you may have:

If you have any questions, write to me or call (414) 497-3000.

Please return the questionnaire in the postage paid envelope. Thank you.

0	1	4			

QUESTIONNAIRE

The purpose of this questionnaire is to determine how essential the following mathematical tasks are in the performance of INSTRUMENTATION work.

PART ONE

DIRECTIONS: Please fill in the blank, or circle the number that best indicates your response to the statement.

1. What is your present status?
   - a. Employee
   - b. Employer/Supervisor
2. What is your job description or job title?

   ____

OPTIONAL INFORMATION:

Name ______________________________

Company ______________________________

Address ______________________________

____

If you would like a summary of the results, please check the box: ☐

PART TWO

DIRECTIONS:

(1) For Rating Scale

Circle the number on the "Rating Scale" that best indicates your response on how essential the task is in the performance of INSTRUMENTATION work. Use the following responses:

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

(2) For Frequency Scale

Circle the number on the "Frequency of Use Scale" that best indicates your response on how often the task is used. Use the following responses:

1 = Never
2 = Occasionally
3 = Regularly

	RATING	FREQUENCY
EXAMPLE: Compute the area of a rectangle	1 2 3 4 5	1 2 3

The following is the list of mathematical tasks.

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
1. Use a calculator with arithmetic and trigonometric functions	1 2 3 4 5	1 2 3
2. Make calculations involving significant digits that match the precision of given data	1 2 3 4 5	1 2 3
3. Make calculations using formulas with grouping symbols that indicate the order which operations are to be performed: parentheses (), brackets [], and braces {}	1 2 3 4 5	1 2 3
4. Use estimation as a technique to determine the reasonableness of a calculation	1 2 3 4 5	1 2 3

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FREQUENCY SCALE

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MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
5. Perform numeric operations of raising a number to a power (y^x)	1 2 3 4 5	1 2 3
6. Perform numeric operations of extracting the root of a number $(\sqrt[x]{y})$	1 2 3 4 5	1 2 3
7. Perform numeric computations on quantities represented by scientific notation	1 2 3 4 5	1 2 3
8. Use signed numbers to represent magnitudes and directions	1 2 3 4 5	1 2 3
9. Perform numeric operations with signed numbers	1 2 3 4 5	1 2 3
10. Translate word statements into algebraic expressions	1 2 3 4 5	1 2 3
11. Rearrange a formula to solve a specified quantity	1 2 3 4 5	1 2 3
12. Identify formulas in handbooks to solve for unknowns from given data	1 2 3 4 5	1 2 3
13. Rearrange and evaluate two or more formulas to determine an unknown	1 2 3 4 5	1 2 3
14. Use problem solving strategies	1 2 3 4 5	1 2 3
15. Work with ratio and proportional relationships (Charles Law $\frac{T_1}{T_2} = \frac{P_1}{P_2}$)	1 2 3 4 5	1 2 3
16. Work with direct and inverse variations	1 2 3 4 5	1 2 3
17. Solve a quadratic equation for an unknown $(L^2+36-7=42)$	1 2 3 4 5	1 2 3
18. Solve a algebraic fractional equation for an unknown $(\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2})$	1 2 3 4 5	1 2 3
19. Use formulas that involve common (Log) or natural (LN) logarithms	1 2 3 4 5	1 2 3
20. Construct a graph	1 2 3 4 5	1 2 3
21. Locate and plot points in a rectangular coordinate system	1 2 3 4 5	1 2 3

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FREQUENCY SCALE

1 = Never
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3 = Regularly

	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
22.	Solve linear equations in two unknowns (graphically, substitution, addition or subtraction)	1 2 3 4 5	1 2 3
23.	Know slope intercept form of a straight line	1 2 3 4 5	1 2 3
24.	Identify different types of angles	1 2 3 4 5	1 2 3
25.	Determine unknown angles in geometric figures using the principles of opposite, alternate, interior, corresponding, parallel, perpendicular, supplement and complement	1 2 3 4 5	1 2 3
26.	Perform numeric operations on angle measure	1 2 3 4 5	1 2 3
27.	Use absolute and incremental dimensioning	1 2 3 4 5	1 2 3
28.	Determine area of a circle, rectangle, triangle, etc.	1 2 3 4 5	1 2 3
29.	Determine the volume of a cylinder, rectangular solid, sphere, etc	1 2 3 4 5	1 2 3
30.	Determine surface area	1 2 3 4 5	1 2 3
31.	Find the perimeter of a geometric figure	1 2 3 4 5	1 2 3
32.	Solve problems involving chords, arcs, central angles and tangents	1 2 3 4 5	1 2 3
33.	Work with isosceles and equilateral triangles	1 2 3 4 5	1 2 3
34.	Read a rule (English and metric)	1 2 3 4 5	1 2 3
35.	Read a micrometer (English and metric)	1 2 3 4 5	1 2 3
36.	Find the length of an unknown side of a right triangle using the pythagorean theorem $(c^2=a^2+b^2)$	1 2 3 4 5	1 2 3
37.	Solve for unknown lengths or angles of a right triangle using trigonometric functions (SIN, COSINE, TANGENT)	1 2 3 4 5	1 2 3
38.	Solve for unknown lengths or angles of oblique triangles using the Law of SINES and/or COSINES	1 2 3 4 5	1 2 3
39.	Convert degrees to radians	1 2 3 4 5	1 2 3

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FREQUENCY SCALE

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MATHEMATICAL TASKS	RESPONSES RATING	 FREQUENCY
40. Determine angular velocity	1 2 3 4 5	1 2 3
41. Use vectors to represent forces	1 2 3 4 5	1 2 3
42. Solve for unknown forces using vectors	1 2 3 4 5	1 2 3
43. Solve trigonometric equations	1 2 3 4 5	1 2 3
44. Work with SINE wave properties: amplitude, period, lead or log	1 2 3 4 5	1 2 3
45. Use a computer as a aid in problem solving	1 2 3 4 5	1 2 3
46. Find minimum or maximum values	1 2 3 4 5	1 2 3
47. Use integration and differentiation in problem solving ($Q=CE=\int idt$)	1 2 3 4 5	1 2 3
48. Find the amount of work done by a variable force (spring)	1 2 3 4 5	1 2 3
49. Use polar coordinates ($Z=R\pm jX$)	1 2 3 4 5	1 2 3
50. Determine the motion of a particle ($\Sigma=m\dot{v}=\frac{d}{dt}(mv)$)	1 2 3 4 5	1 2 3

51. If you are an employer/supervisor, are you satisfied with the mathematical performance of your employees (technical institute graduates)?

1. Yes 2. No

52. If you are an employee are you satisfied with your mathematical performance on the job?

1. Yes 2. No

53. If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

1. Yes 2. No

0	1	4			

54. Please include here any additional mathematics tasks that you believe are needed.

55. Please include here any further general comments you may have.

If you have any questions, write to me or call (414)497-3000.

Please return the questionnaire in the postage paid envelope. Thank you.

0	1	5			

QUESTIONNAIRE

The purpose of this questionnaire is to determine how essential the following mathematical tasks are in the performance of CARPENTERS work.

PART ONE

DIRECTIONS: Please fill in the blank, or circle the number that best indicates your response to the statement.

1. What is your present status?
   a. Employee
   b. Employer/Supervisor
2. What is your job description or job title?

   ____

OPTIONAL INFORMATION:

Name ______________________________

Company ______________________________

Address ______________________________

____

If you would like a summary of the results, please check the box: ☐

PART TWO

DIRECTIONS:

(1) For Rating Scale

Circle the number on the "Rating Scale" that best indicates your response on how essential the task is in the performance of CARPENTERS work. Use the following responses:

1 = Not Important
2 = Slightly Important
3 = Important
4 = Very Important
5 = Essential

(2) For Frequency Scale

Circle the number on the "Frequency of Use Scale" that best indicates your response on how often the task is used. Use the following responses:

1 = Never
2 = Occasionally
3 = Regularly

	RATING	FREQUENCY
EXAMPLE: Compute the area of a rectangle	1 2 3 4 5	1 2 3

The following is the list of mathematical tasks.

MATHEMATICAL TASKS	RESPONSES	
	RATING	FREQUENCY
1. Determine which of two whole numbers is greater (or less)	1 2 3 4 5	1 2 3
2. Perform numeric operations with whole numbers (addition, subtraction, multiplication, and division)	1 2 3 4 5	1 2 3
3. Say, read, write fractions	1 2 3 4 5	1 2 3
4. Determine which of two fractions is greater (or less)	1 2 3 4 5	1 2 3
5. Perform numeric operations with fractions	1 2 3 4 5	1 2 3

RATING SCALE

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3 = Important
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FREQUENCY SCALE

1 = Never
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	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
6.	Reduce fractions to lowest terms	1 2 3 4 5	1 2 3
7.	Determine which of two decimals is greater (or less)	1 2 3 4 5	1 2 3
8.	Convert fractions to decimals and vice versa	1 2 3 4 5	1 2 3
9.	Perform numeric operations with decimals	1 2 3 4 5	1 2 3
10.	Perform numeric operations with mixed numbers	1 2 3 4 5	1 2 3
11.	Round off numbers and decimals	1 2 3 4 5	1 2 3
12.	Determine which of two measurements is more precise	1 2 3 4 5	1 2 3
13.	Estimate the results of numeric operations before performing the calculations	1 2 3 4 5	1 2 3
14.	Use a calculator	1 2 3 4 5	1 2 3
15.	Find square root ($\sqrt{x}$) and square a number (x^2)	1 2 3 4 5	1 2 3
16.	Define percentage	1 2 3 4 5	1 2 3
17.	Convert fractions to decimals, decimals to percent, fractions to percent and/or vice versa	1 2 3 4 5	1 2 3
18.	Determine percentage, base, or rate given any two of the three	1 2 3 4 5	1 2 3
19.	Estimate the amount of roof boards to order given the area and percent waste	1 2 3 4 5	1 2 3
20.	Determine the percent spent on materials given the cost of materials and total cost of construction	1 2 3 4 5	1 2 3
21.	Find the bid price given estimated cost and cost percent	1 2 3 4 5	1 2 3
22.	Calculate the interest to charge on a bill given the amount of bill, interest rate and time that the bill was unpaid	1 2 3 4 5	1 2 3

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FREQUENCY SCALE

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	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
23.	Calculate the cash discount on a quotation given the terms of sale	1 2 3 4 5	1 2 3
24.	Calculate cost of material given the trade discount and list price	1 2 3 4 5	1 2 3
25.	Understand the concepts: point, line, plane, parallel, perpendicular, and angle	1 2 3 4 5	1 2 3
26.	Construct basic geometric figures (square, circle, triangle, etc.)	1 2 3 4 5	1 2 3
27.	Read a micrometer	1 2 3 4 5	1 2 3
28.	Measure distance, weight, time, capacity and temperature in both metric and/or English units	1 2 3 4 5	1 2 3
29.	Determine accuracy and relative error in measurements	1 2 3 4 5	1 2 3
30.	Measure from scale drawings	1 2 3 4 5	1 2 3
31.	Determine the area of basic geometric figures	1 2 3 4 5	1 2 3
32.	Find the distance around basic geometric figures (perimeter)	1 2 3 4 5	1 2 3
33.	Find the volume of various geometric solids (cylinders, cubes, cones, pyramids)	1 2 3 4 5	1 2 3
34.	Calculate board feet	1 2 3 4 5	1 2 3
35.	Calculate surface area (cylinder, box, etc.)	1 2 3 4 5	1 2 3
36.	Convert units of measurement	1 2 3 4 5	1 2 3
37.	Scale something up or down	1 2 3 4 5	1 2 3
38.	Define degrees, minutes, and seconds	1 2 3 4 5	1 2 3
39.	Measure an angle using a protractor	1 2 3 4 5	1 2 3
40.	Add and subtract angles	1 2 3 4 5	1 2 3

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FREQUENCY SCALE

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	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
41.	Understand the meaning of right, acute, obtuse, supplimentary and complementary angles	1 2 3 4 5	1 2 3
42.	Determine saw settings for various angle, level, and compound saw cuts	1 2 3 4 5	1 2 3
43.	Estimate the number of floor joists required for a certain building	1 2 3 4 5	1 2 3
44.	Estimate the number of plywood panels needed for a subfloor	1 2 3 4 5	1 2 3
45.	Determine roof pitch given the run and rise	1 2 3 4 5	1 2 3
46.	Calculate the number of squares of shingles required to cover a roof given pitch, span, ridge length, and shingle exposure	1 2 3 4 5	1 2 3
47.	Perform numeric operations with signed numbers (+ or −)	1 2 3 4 5	1 2 3
48.	Use order of operation, parenthesis, brackets and/or braces to solve numeric expressions	1 2 3 4 5	1 2 3
49.	Solve ratio problems	1 2 3 4 5	1 2 3
50.	Perform algebraic addition, subtraction, multiplication, and division	1 2 3 4 5	1 2 3
51.	Substitute into a formula	1 2 3 4 5	1 2 3
52.	Rearrange a formula for a unknown quantity	1 2 3 4 5	1 2 3
53.	Solve simple algebraic equations with one unknown ($3x=6$, for x)	1 2 3 4 5	1 2 3
54.	Know strategies of problem solving	1 2 3 4 5	1 2 3
55.	Take everyday problems, translate into mathematical expressions, solve and interpret the results	1 2 3 4 5	1 2 3
56.	Define a right triangle	1 2 3 4 5	1 2 3

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FREQUENCY SCALE

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	MATHEMATICAL TASKS	RESPONSES	
		RATING	FREQUENCY
57.	Find the length of a rafter using the pythagorean theorem	1 2 3 4 5	1 2 3
58.	Find the length of a rafter using a rafter table	1 2 3 4 5	1 2 3
59.	Read a trigonometric table to find the values of various trigonometric functions (SIN, COS, TAN)	1 2 3 4 5	1 2 3
60.	Apply the SINE, COSINE, and TANGENT functions to the solving of right triangle problems	1 2 3 4 5	1 2 3
61.	Use vectors to represent the forces in a rafter	1 2 3 4 5	1 2 3
62.	Add and subtract vectors	1 2 3 4 5	1 2 3
63.	Calculate feet per second given R.P.M.	1 2 3 4 5	1 2 3
64.	Determine central tendencies (mean, mode, and median)	1 2 3 4 5	1 2 3
65.	Calculate the area of a hip roof	1 2 3 4 5	1 2 3

66. If you are an employer/supervisor, are you satisfied with the mathematical performance of your employees (technical institute graduates)?

1. Yes 2. No

67. If you are an employee are you satisfied with your mathematical performance on the job?

1. Yes 2. No

68. If you are an employee, are you satisfied with the mathematical preparation you received at the technical institute you attended?

1. Yes 2. No

69. Please include here any additional mathematics tasks that you believe are needed:

70. Please include here any further general comments you may have:

If you have any questions, write to me or call (414) 497-3000.

Please return the questionnaire in the postage paid envelope. Thank you.

APPENDIX F

RESPONSES TO OPEN ENDED QUESTIONS

ACCOUNT CLERK - 1

JOB TITLE

EMPLOYEE	EMPLOYER
Head Teller	Vice President
Office Manager	Accounting and Data Processing
Bookkeeper	Accounting Director
Accounts Payable Clerk	Manager Data Processing
Bookkeeper	Chief Accountant
Payroll Clerk	President
Billing Clerk	Assistant Treasurer
Bookkeeping	Controller
Assistant Computer Operator	Credit Union
Executive Secretary	Manager
Secretary	Comptroller
Bookkeeper	Vice President-Cashier
Accounts Clerk	
Cost Accounting Clerk	Manager Financial Department
	Cost Accounting Supervisor

ACCOUNT CLERK - 1
QUESTION - 40
ADDITIONAL MATH TASKS

EMPLOYEE	EMPLOYER
Should be able to do tax forms for a business. Make up budgets, do audits, ledger and journal work.	Need more practical problem solving in the financial area understand debits and credits, basic accounting use common sense. Plain basic mathematics. More electronic calculators.

ACCOUNT CLERK - 1
QUESTION 41
GENERAL COMMENTS

EMPLOYEE

Enough math for current job. These questions certainly pertain to my job activities. Technical Institute prepared me with all the qualities I need for my job. Most important part is using the calculator and machine calculations. The Technical Institute is doing a fine job. Keep up the good work. Use of calculator important. More familiarization with bookkeeping machines converting decimals and fractions to percents proved helpful. Didn't learn it in high school. Couldn't do job without skills learned at Technical Institute. Going to the Technical Institute is the best step I have made in life. Need more on computers, and payroll preparation.

EMPLOYER

Need more work on common sense problems. More work with estimation and reasonableness test on an invoice. Need training working with public and problem solving. Technical Institute does excellent job in training. Account clerk should be able to do all tasks on survey. Math skills need to be raised to higher levels. Completely satisfied with Technical Institute Graduates.

ACCOUNTING - 2
JOB TITLE

EMPLOYEE

Teller.
Accounts Payable
Accounts Receivable
Accounts Assistant
Financial Secretary
Bookkeeper
Inventory Control
Payroll
Auditor
Accountant

EMPLOYER

Controller
President
Accounting Supervisor
Accounting Manager
Vice President
Accountant
Office Manager
Corporate Accountant
Business Manager
Systems Accountant

ACCOUNTING - 2
QUESTION 57
ADDITIONAL MATH TASKS

EMPLOYEE	EMPLOYER
More time spent on teaching algebraic equations. Units of measure should be covered. You have covered everything. Teaching of the math was excellent. Stronger preparation in use of computer in problem solving. More present value problems and inflationary accounting Units of measurement needed and metric system conversions. A more practical approach to basic skills. More algebra is needed in the accounting math course. Ability to calculate without a calculator.	More emphasis on algebra and problem solving models. A good knowledge of algebra is essential. Simple adding, and subtracting of numbers using the brain not a machine. Auditing data with statistical methods.

ACCOUNTING - 2
QUESTION 58
GENERAL COMMENTS

EMPLOYEE	EMPLOYER
Employers are not aware of what Technical Institute graduates know. I am not fully utilized. I have not had a chance to put my skills to work on my present job. All bookkeeping is done by computer. Need more courses in reading computer printouts and reports Teach math functions on basis of how to use them and what they do. Accept the formulas as fact. More emphasis in setting up a bookkeeping system needed in a course. (For a small company without a computer).	Students are weak in using estimation and use of reasonableness test. Too dependent on calculators and don't really understand basic math. Accountants need ratio, percent, statistics, projections, etc. The solution of simple linear equations (X-3=5) The computer performs the accounting Data Processing is essential for accountants. Employees must learn to express themselves verbally with respect to mathematical functions and results. Use estimation to determine reasonableness to a result is used in checking computer reports.

MECHANICAL DRAFTING - 3
JOB TITLE

EMPLOYEE	EMPLOYER
Mechanical Draftsman	Vice President Engineering
Design Engineer	Engineering Manager
Engineer - Draftsman	Drafting Supervisor
Draw and Check	President
Assembly Drawings	Chief of Graphics
	Manager of Engineering and Quality Control
	Vice President Engineering
	Chief Engineer

MECHANICAL DRAFTING - 3
QUESTION 50
ADDITIONAL MATH TASKS

EMPLOYEE	EMPLOYER
Trigonometry is very important! Trigonometry is used every day! I feel that Trig. should be covered thoroughly!!!	A basic understanding of calculus

MECHANICAL DRAFTING - 3
QUESTION 51
GENERAL COMMENTS

EMPLOYEE	EMPLOYER
Basic math concepts have to be known.	Computers and applications for design will be more important in the future. All the above math tasks are needed for a draftsman to survive.

MECHANICAL DESIGN - 4
JOB TITLE

EMPLOYEE	EMPLOYER
Draftsman	President
Design Draftsman	Vice President Engineering
Mechanical Engineer	Assistant to Vice President Engineering
Plant Draftsman	Chief Engineer
Engineering Technician	President (Mechanical Designer)
Project Leader - Machine Design	
Draftsman	
R & D Lab Technician	
Mechanical Designer	
Senior Draftsman	
Junior Designer	
Process/Design Engineer	
Inspector	
Designer/Draftsman	
Detailer	
Draftsman	
Engineering Technician	
Designer	
Layout Draftsman	

MECHANICAL DESIGN - 4
QUESTION 51
ADDITIONAL MATH TASKS

EMPLOYEE	EMPLOYER
Study Trigonometric functions thoroughly. Center of gravities, directions, factor of safety are needed. For a program including strength of materials a course in calculus would not hurt. Many engineer manuals utilize calculus. Calculus is needed to interpret them. Strength of Materials should be a two semester course. Three dimensional vectors. Load and stress problems. Electrical math. Need more basic geometry.	Ability to convert to metrics and from metrics. Emphasis on estimating to determine feasibility.

MECHANICAL DESIGN - 4
QUESTION 52
GENERAL COMMENTS

EMPLOYEE	EMPLOYER
A related computer course is needed. Learn as much math as possible. Some background in logic circuitry, electronics, and semiconductors would be helpful. A course in calculus is needed. My math background far exceeds what I need at my current position. I solve math problems for engineers. It is a must to include a course on computers and their operation.	My math background helped push me before others in advancement. Ability to sketch - ability to write a report on the work done. Recommend additional training and exercise in analysis, problem solving and creativity.

MACHINE TOOL - 5
JOB TITLE

EMPLOYEE	EMPLOYER
Machinist	Shop manager
Tool Maker	Special Projects
Machine Operator	Manager
Horizontal Boring Mill	Manager of Manufacturing and Engineering
Operator	Machine Shop
Lathe Operator	Superintendent
Mechanical Technician	President
Tool & Die	
Inspector	
Vertical Mill Operator	
Turret Lathe Operator	
Run Panto Graph Machine	

MACHINE TOOL - 5
QUESTION 68
ADDITIONAL MATH TASKS

EMPLOYEE	EMPLOYER
	Seems like you have covered most aspects some calculus would also help. Accuracy - checking work before cutting metal.

MACHINE TOOL - 5
QUESTION 69
GENERAL COMMENTS

EMPLOYEE	EMPLOYER
	The math program at the Tech School was a good one. Fits and tolerances should be covered. Percentage and algebra is not used in the machine shop. More mathematics is needed. All students should know the proper use of tables and handbook formulas. You have covered all the bases. With a good knowledge of basic math almost any problem can be solved.

AUTO MECHANICS - 6
JOB TITLE

EMPLOYEE

Auto Mechanic
Rebuild Transmissions
Mechanic
Sales
Auto Service Technician
Heavy Equipment Mechanic
Diesel Mechanic

EMPLOYER

Owner
President
Manager
Dealer
Service Manager
Shop Foreman
Vice President
Money Counting and Change Making

AUTO MECHANICS - 6
QUESTION 79
ADDITIONAL MATH TASKS

EMPLOYEE

More Metric conversion.
More Metric, more basic math, and less geometry.

EMPLOYER

Common sense. Proficiency in basic math estimation. Weight knowing volume and type of material, also pressures knowing surface area. I believe you have covered this area very thoroughly.

AUTO MECHANICS - 6
QUESTION 80
GENERAL COMMENTS

EMPLOYEE

Numbers are read or counted rather than calculated. Relate math to auto mechanics.

EMPLOYER

Teach have to work for a living. One hour of work is one hour of pay. How to write and speak. Sales courtesy and customer relations. Employees trained at your technical institute are doing well.

AUTO PARTS - 7
JOB TITLE

EMPLOYEE	EMPLOYER
Parts counterman	Parts Department
Service Parts	Manager
Auto Parts	Parts Merchandising
Parts Office Worker	Manager
District Representative	Owner
Dispatch Warranty	Manager
Customer Body Shop	

AUTO PARTS - 7
QUESTON 79
ADDITIONAL MATH TASKS

EMPLOYER	EMPLOYEE
Speed and Accuracy are important fcr work.	

AUTO PARTS - 7
QUESTION 80
GENERAL COMMENTS

EMPLOYEE	EMPLOYER
Technical institute has a good math program. Course must be directly related to auto parts. All math should be left to the math instructors not auto parts instructors.	Some accounting knowledge is needed. Some marketing and sales is needed.

AUTO BODY - 8
JOB TITLE

EMPLOYEE	EMPLOYER
Body Man	Auto Body
Auto Body Repair Technician	Manager
Auto Body Technician	Service Director
	General Manager
	Owner
	Shop Owner
	Assistant Body Shop Manager
	Body Shop Manager

AUTO BODY - 8
QUESTION 79
ADDITIONAL MATH TASKS

EMPLOYEE	EMPLOYER
Do math without calculators.	Read a rule. Prepare estimates. Very essential to compute percentages for reduction of paint. Some bookkeeping. Estimating. Liquid Measure.

AUTO BODY - 8
QUESTION 80
GENERAL COMMENTS

EMPLOYEE	EMPLOYER
	Basic arithmetic is all that is needed for auto body repair. Estimating is also important. A course in logical deductions would be beneficial.

DIESEL MECHANICS - 9
JOB TITLE

EMPLOYEE	EMPLOYER
Mechanic	President
Diesel Mechanic	General Manager
Diesel Shop Manager	Service Manager
Heavy Equipment Mechanic	Manager
Front end truck Mechanic	Personnel Admin.
	Estimation and Assistant Manager
	Product Support Manager
	Fleet Maintenance Supervisor
	General Service Manager
	Parts and shop manager

DIESEL MECHANICS - 9
QUESTION 79
ADDITIONAL MATH TASKS

EMPLOYEE	EMPLOYER
All the math available is important to get some where. More on basic problem solving with an unknown. More on tapers, angles and how to figure.	Being able to figure out formulas. Proficiency in reading dial indicators and micrometers.

DIESEL MECHANICS - 9
QUESTION 80
GENERAL COMMENTS

EMPLOYEE	EMPLOYER
Some of the math tasks on the survey I do not use, but to move ahead in life they will help greatly. I would have liked to have more math-geometry. Give the students the opportunity to learn all the math they can because they will never be sorry they learned it. Should have been more. The school is very good. Glad to help out.	

WELDING - 10
JOB TITLE

EMPLOYEE	EMPLOYER
Welder Fabricator	Vice President Manufacturing Welding Engineer Welding Supervisor President Department Head Plant Manager Manager Quality Control Plant Superintendent Shop Manager Welding Foreman Owner

WELDING - 10
QUESTION 71
ADDITIONAL MATH TASKS

EMPLOYEE	EMPLOYER
More time on fractions. Math course should be two semesters. Find minimum amounts used and finding minimum and maximum cost.	Calculate weld size and strength of the weld. Reduce waste, Reduce overwelding, and constantly cut costs. Improve on measuring skills.

WELDING - 10
QUESTION 72
GENERAL COMMENTS

EMPLOYEE	EMPLOYER
Need more on areas and volumes. Find least amount of material to use.	Courses should be taught as another tool in the welding trade.

RETAIL SALES - 11
JOB TITLE

EMPLOYEE	EMPLOYER
Auto Sales Clerk	Manager
Store Clerk	Merchandiser
Sales Manager	Manager
	Vice President - Owner
	Store Manager
	Treasurer
	Credit Manager and Warehouse Supervisor
	General Manager
	Sec.-Treas of Corporation

RETAIL SALES
QUESTION 58
ADDITIONAL MATH TASKS

EMPLOYEE	EMPLOYER
Almost all aspects of math should be emphasized.	Ratios, percentages, and basic math.

RETAIL SALES - 11
QUESTION 59
GENERAL COMMENTS

EMPLOYEE	EMPLOYER
Math is one of the most important tools to have when we are working in the retail sales field. I'm glad someone is doing something in order to get a response towards math. I feel it is too often overlooked. On my present job I don't need to know half the things I learned but I am still glad I have the knowledge in case I would ever change jobs.	Employees should have basic math skills and not be too dependent on the calculator.

SALES MANAGEMENT - 12
JOB TITLE

EMPLOYEE	EMPLOYER
Retail foods ass't manager	Store manager
Assistant Manager	Manager
District Manager	Marketing Director
Salesman window and door Manufacturer.	General Manager
	Owner
Assistant Manager-Sporting Goods	Assistant Manager
Sales/Service	Merchandise Manager
Sales Engineer	Vice President
	District Manager
	Area Manager
	Owner
	Personnel Manager
	Sales Manager
	Food Store Manager
	President
	Business General Manager

SALES MANAGEMENT - 12
QUESTION 58
ADDITIONAL MATH TASKS

EMPLOYEE	EMPLOYER
More basic math skills, adding, subtration, multiplying percentages, decimals. The math course should deal more with the cost of goods factor. Greater understanding of calculators and capabilities - How to use.	Comparisons of actual to budget and variance. Evaluation of operating statements. Key ratios of retail from the balance sheet. Any additional ways in which fewer mistakes can be made and yet faster work maintained.

SALES MANAGEMENT - 12
QUESTION 59
GENERAL COMMENTS

EMPLOYEE	EMPLOYER
Mathematics needed. Seems to be covered well. Very complete survey. I think more math classes should be required. The things that were important were not stressed enough-. I have found many mathematical skills either learned or reviewed, in tech. school to be very useful. I feel the two required math courses are essential and helpful.	Teach profitability. I do think tech. school furthered my cause in pursuing my career and I think that this here study is an indication of furthering its helpfulness. This survey shows that you are interested in how your field applies to the business world. The students can learn the numbers they need to know the relations. Basic knowledge of ratios and percents is the most common aspect missing in students today. Percentage is essential, strong background in accounting and PL statements important.

ELECTRICITY (ELECTRICAL POWER) - 13
JOB TITLE

EMPLOYEE	EMPLOYER
Electrician	Superintendent Operations
Apprentice Lineman	Manager
Maintenance Electrician	General Superintendent
Industrial and Maintenance Electrician	Foreman
Electrical Apprentice	General Manager
Chief Electrician	Owner
Plant Electrician	Electrical Foreman
	Journeyman Wireman
	Supervisor
	Chief Electrician
	Inspector
	Owner-Manager

ELECTRICITY (ELECTRICAL POWER) - 13
QUESTION 48
ADDITIONAL MATH TASKS

EMPLOYEE	EMPLOYER
Transformer Sizing Full load current.	Basic Math skills are required. Estimating length of time to do a job. Math should be a requirement for all students in electricity classes.

ELECTRICITY (ELECTRICAL POWER) - 13
QUESTION 49
GENERAL COMMENTS

EMPLOYEE	EMPLOYER
The training I received at Tech. school helped me to advance faster. I think just general basic math should be stressed. The math related course should correspond to the major course. The mathematics tasks performed in the major course were far more advanced than that of the math related course. Many of the skills that you have mentioned should still be taught... I find mathematics an important tool in my daily tasks.	Thank you for allowing input.

INSTRUMENTATION (INDUSTRIAL ELECTRONICS) - 14
JOB TITLE

EMPLOYEE

System Checkout Technician.
Computer Technician
Checkout Technician
Field Service Rep.
Test Technician
Technical Specialist
Checkout Engineer
Instrumentation Technician
Field Service Technician
Process Control Specialist
Instrument Tech.
Customer Engineer

EMPLOYER

Electronic Technician Supervisor
Personnel Administratior
Production Engineering Manager
Electrical Department
Supervisor
Maintenance and Engineering Supervisor
Branch Field Engineer Manager
Manager Quality Assurance
Instrument Supervisor

INSTRUMENTATION (INDUSTRIAL ELECTRONICS) - 14
QUESTION 54
ADDITIONAL MATH TASKS

EMPLOYEE

Much more computer terminal training. Sine wave evaluation. In computer field need strong Boolean algebra. Must be able to follow formulas or directions carefully. It is essential to have a good knowledge of math.

EMPLOYER

Statistical concepts. Boolean algebra. Should know programmable calculator concepts. Ability to use a scientific programmable calculator.

INSTRUMENTATION (INDUSTRIAL ELECTRONICS) - 14
QUESTION 55
GENERAL COMMENTS

EMPLOYEE	EMPLOYER
I do think a strong math background helped me to be a problem solver. A good math background develops logical thinking, and gives a technique in problem solving. Translating computer operations or instructions is very helpful. The mathematics courses that I have taken have been a big help. Many of the complex operations and equation solving exercises helped me to develop a logical thought pattern, and the ability to "reason out" a problem. Many mathematical operations help you understand how instruments function. Formulas are used to calibrate equipment. Just about all the math skills I learned in school I use or relate to, to solve problems I encounter in my work one time or another. Math course is very important.	I only wish common sense could be taught.

CARPENTERS - 15
JOB TITLE

EMPLOYEE	EMPLOYER
Cabinet Maker	Printer in Building Form
Carpenter	General Contractor
Mill Wright	Home Builder
Apprentice Carpenter	Manager
Carpenters Helper	Owner Cabinet Company
	Owner Construction Company
	Project Manager
	Foreman

CARPENTERS - 15
QUESTION 69
ADDITONAL MATH TASKS

EMPLOYEE	EMPLOYER
More math problems involving every day situations. You run into on the job. Relate more to the carpenter and cabinet maker on the job. I think that working with fractions and equations that help find the area of some object is very important.	To be able to read a tape measure accurately. To know the divisions of an inch on a tape measure. Accurate readings on transit, tape measure, level. Trig. How to use a carpenter square fully. Conversions of fractions to decimals.

CARPENTERS - 15
QUESTION 70
GENERAL COMMENTS

EMPLOYEE	EMPLOYER
Math plays a great deal with todays carpenter. I think the basics of math should be stressed very highly. Being able to estimate is a very important factor in carpentry. I think math is very important in carpentry work, even more so if one wants to go into business himself. When your in business you have to estimate time spent, amount of materials, and cost of materials. The better the math skills the less time will be spent on the job.	I see basic math concepts losing ground to the computer. One or the most important areas needing coverage at this time is the metric system. calculation, reading and understanding. Also metric conversion (effective 1981).

APPENDIX G

PROFILE MATRIX

OCCUPATIONS

MATHEMATICS TASKS

ARITHMETIC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	CORE
1 0 0																x
1 0 1																x
1 0 2																x
1 0 3																x
1 0 4																x
1 0 5																x
1 0 6																x
1 0 7																x
1 0 8																x
1 0 9																x
1 1 0																x
1 1 1																x
1 1 2																x
1 1 3																x
1 1 4																x
1 1 5																x
1 1 6			x	x	x	x	x	x	x	x			x	x	x	
1 1 7																x
1 1 8																x
1 1 9																x
1 2 0			x	x	x									x	x	
1 2 1										0						x
1 2 2										0						x
1 2 3										0						x
1 2 4										0						x
1 2 5										0						x
1 2 6										0						x
1 2 7										0						x
1 2 8										0						x

0 - OMIT FROM CORE

CORE - COMMON TO ALL OCCUPATIONS

X - MATH TASK IS ESSENTIAL TO OCCUPATION

NUMBERS IN LEFT HAND COLUMN REPRESENT MATHEMATICS COMPETENCIES FROM MASTER LIST APPENDIX A.

THE HORIZONTAL NUMBERS REPRESENT THE FIFTEEN OCCUPATIONAL PROGRAM AREAS.

APPENDIX G

OCCUPATIONS

MATHEMATICS TASKS

MENSURATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	CORE
200			x	x	x			x	x	x					x	
201			x	x	x			x	x	x					x	
202			x	x	x			x	x	x			x		x	
203			x	x	x	x		x	x	x					x	
204			x	x	x	x		x	x	x						
205			x	x	x	x	x	x	x	x			x		x	
206			x	x	x	x	x	x	x	x					x	
207			x	x	x	x	x	x							x	
208			x	x	x	x		x	x	x	x	x	x		x	
209			x	x	x				x	x			x	x	x	
210			x	x	x				x	x			x	x	x	
211			x	x	x				x	x			x	x	x	
212			x	x	x				x	x			x	x	x	
213			x	x	x				x	x			x	x	x	
214			x	x	x				x	x			x	x	x	
215			x	x	x				x	x				x	x	
216			x	x	x				x	x				x	x	
217			x	x	x				x	x					x	
218			x	x	x	x	x	x	x						x	
219																x
220																x
221			x	x	x				x						x	
222			x	x	x				x						x	
223			x	x	x				x						x	
224			x	x	x										x	
225			x	x	x										x	
226			x	x	x										x	
227			x	x	x	x	x	x	x	x	x	x	x	x	x	
228			x	x	x										x	
229			x	x	x			x	x	x				x	x	
230			x	x	x			x	x	x					x	
231			x	x	x										x	
232			x	x	x				x	x				x	x	
233			x	x	x	x		x	x	x					x	
234			x	x	x										x	
235			x	x	x	x		x	x	x					x	

APPENDIX G

OCCUPATIONS

MATHEMATICS TASKS

ALGEBRAIC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	CORE
300				x	x						x	x	x	x	x	
301				x												
302				x									x	x		
303				x									x	x		
304				x										x		
305		x	x	x	x	x	x		x					x	x	
306	x	x	x	x	x	x	x		x		x	x		x	x	
307				x							x	x	x	x	x	
308			x	x										x		
309				x	x	x	x		x		x	x	x	x		
310		x	x	x	x	x							x	x		
311			x	x							x	x	x	x	x	
312			x	x					x			x	x	x	x	
313			x	x			x		x		x			x		
314				x										x		
315			x	x	x									x		
316			x	x	x									x		
317				x												
318				x												
319				x									x	x		
320				x												
321			x	x										x		
322			x	x												
323				x												
324				x												
325																
326																
327																
328																
329																
330																
331																
332			x	x												
333			x													
334																
335																
336																
337																
338		x	x	x		x	x	x	x	x				x	x	
339				x		x	x	x	x	x				x	x	
340				x		x	x	x	x	x				x	x	

APPENDIX G

MATHEMATICS TASKS

	OCCUPATIONS															
TRIGONOMETRIC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	CORE
400			x	x	x					x			x	x	x	
401																
402																
403			x	x	x					x				x	x	
404																
405					x									x		
406			x	x	x								x	x		
407			x	x	x					x			x	x		
408			x	x	x											
409			x	x	x									x		
410			x	x	x									x		
411			x	x										x		
412			x	x										x		
413			x	x										x		
414			x	x										x		
415			x	x										x		
416																
417				x										x		
418																
419																
420																
421				x												
422																
423			x	x	x	x			x							
424					x											

APPENDIX G

OCCUPATIONS

MATHEMATICS TASKS

STATISTICAL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	CORE
501																
502		x				x			x			x				
503		x	x			x			x			x		x		
504						x	x	x	x	x						
505																
506																
507																
508																
509																
510																
511																
512																
513		x														
514		x														
515																
516												x				
517												x				
518																
519																
520												x				

MATH TASKS

COMPUTER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	CORE
601	x	x														
602	x	x	x	x		x	x				x	x				
603	x	x	x	x							x	x		x		
604	x	x	x	x		x	x									
605	x	x	x	x		x	x				x	x				
606																
607																
608		x		x												
609																
610	x															

MATH TASKS

CALCULUS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	CORE
700																
701																
702																
703																
704				x										x		
705																
706																
707				x												
708				x												
709																
710																
711				x												